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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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VOLUME 19 NUMBER 22/NOVEMBER 23, 1981

TABLE OF CONTENTS

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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3003

02 AERODYNAMICS 3006
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

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03 AIR TRANSPORTATION AND SAFETY 3010
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For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3011
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3013
Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 3015
Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

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Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 3019
Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 3020
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For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

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For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 3023
For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 3027
Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 3027
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 3027
Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 3028
Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING N.A.
Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3029
Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 3029
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

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Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
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23 CHEMISTRY AND MATERIALS (GENERAL) 3030
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3030
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3032
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 3036
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3041
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3044
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

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For related information see also *Physics*.

31 ENGINEERING (GENERAL) 3047
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 3048
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3056
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 3059
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 3064
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 3064
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3066
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3068
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3068
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) 3072

43 EARTH RESOURCES 3073
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 3077
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 3084
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3087
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 3092
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3101
Includes biological, dynamic and physical oceanography; and marine resources.

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51 LIFE SCIENCES (GENERAL) 3102
Includes genetics.

52 AEROSPACE MEDICINE 3103
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 3106
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 3107
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 3108
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 3110
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS N.A.
Includes computer networks.

63 CYBERNETICS 3115
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 3116
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 3117
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 3121
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS N.A.
Includes topology and number theory.

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Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 3121
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 3122
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS 3123
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 3125
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS 3126
Includes light phenomena.

75 PLASMA PHYSICS 3131
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS 3134
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS 3138
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) N.A.
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83 ECONOMICS AND COST ANALYSIS 3139
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3139
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3140
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 3141
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3142
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3142
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3143
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3144
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

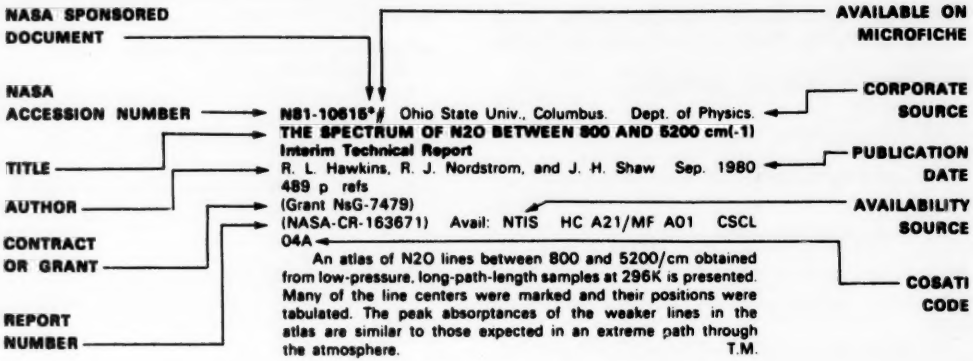
GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-57
CORPORATE SOURCE INDEX I-65
CONTRACT NUMBER INDEX I-79
REPORT/ACCESSION NUMBER INDEX I-83

TYPICAL CITATION AND ABSTRACT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N81-10615*# Ohio State Univ., Columbus. Dept. of Physics.
CORPORATE SOURCE
THE SPECTRUM OF N2O BETWEEN 800 AND 5200 cm(-1)
Interim Technical Report
TITLE
R. L. Hawkins, R. J. Nordstrom, and J. H. Shaw Sep. 1980
PUBLICATION DATE
489 p refs
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An atlas of N2O lines between 800 and 5200/cm obtained from low-pressure, long-path-length samples at 296K is presented. Many of the line centers were marked and their positions were tabulated. The peak absorptances of the weaker lines in the atlas are similar to those expected in an extreme path through the atmosphere. T.M.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, AIRCRAFT-SHIP EQUIPMENT STUDIES
D.P. Woodman, GTE Sylvania Inc., *Mountain View, California* (DN096144)

In order to optimize V/STOL takeoff/landing operations, investigations will be performed on the takeoff and landing interfaces between V/STOL aircraft and their projected platforms and to provide detailed studies of their potential problem areas.

The following evaluations and analyses will be conducted: (1) candidate tracking systems; (2) pilot data related to approach profiles, information sources, visual ranges and levels and types of data; (3) aircraft deck handling simulation; (4) conceptual studies for emergency recovery of V/STOL aircraft; (5) development of a baseline of V/STOL aircraft, interface equipment and ship data.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Engineering Center

1.0002, FURTHER WIND TUNNEL INVESTIGATIONS OF A WING/STORE FLUTTER SUPPRESSION SYSTEM
C. Hwang, Northrop Corp., *3901 W. Broadway, Hawthorne, California* 90250 (DF142180; F33615-78-C-3221)

High performance fighter attack aircraft are required to carry many combinations of external wing-mounted stores to obtain operational effectiveness in the combat role. However, some wing/store configurations are found to be critical from the standpoint of preventing flutter from occurring within the desired operational flight envelope. Speed placards are presently the only means of preventing this flutter, but this technique generally results in significant losses in aircraft performance. The objective of this program is to conduct wind tunnel tests on an aeroelastic model with external stores to further investigate critical parameters. The technology gained from this program will ultimately result in an expanded attack envelope, increased survivability (reduced cost per target kill), and improved operational flexibility on fighter attack aircraft with an air-to-ground mission.

The existing flutter model will be refurbished to include additional sensors, new control surface actuators, and new and improved control laws. In order to prevent severe damage to the model if flutter is unexpectedly encountered, a new store with a movable mass will be designed and fabricated, and will be controlled by an automatic flutter sensing unit. Additional analytical studies will be conducted to develop the new control laws which could possibly include AFFDL, French and British control laws. Two test entries will be performed with the cooperation of NASA Langley at the 16-foot transonic dynamics tunnel. These tests will be conducted to evaluate the control laws described earlier as well as adaptive control laws which will be developed under a separate AFFDL contract.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, AERONAUTICAL TECHNOLOGY, TECH AREA K - FLIGHT SIMULATION
I.C. Statler, U.S. National Aeronautics & Space Admin., Ames Research Center, *Moffett Field, California* 94035 (DA0D5004)

Perform analyses and design studies to determine the requirements and development specifications for an advanced rotary wing R&D flight simulator capable of simulating NOE flight operations. This effort complements the hardware development being conducted under 6.3 project 1l263216DB34, the rotorcraft systems integration simulator (RSIS).

Perform the analyses and design studies, in joint participation with NASA, to modify the NASA vertical motion simulator (VMS) to meet the Army's mission requirements.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Aeromechanics Lab.

1.0004, RESEARCH PROGRAM IN ACTIVE CONTROL/AEROELASTICITY IN THE JIAFS AT NASA/LRC
H. Liebowitz, George Washington University, School of Engineering & Applied Sciences, Dept. of Civil Mechanical & Environmental Engineering, *725 23rd St. N.W., Washington, District of Columbia* 20037 (NAG 1-199)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0005, MILITARIZED HELICOPTER TRANSPORTED CONTAINER HANDLING DEVICE
S.P. Jarosinski, Martin Marietta Corp., *1450 S. Rolling Rd., Baltimore, Maryland* 21227 (DA0E3844; DAAK51 78 C 0026)

The objective of this contract is for ATL to procure an operational prototype helicopter transported container lift adapter to be used for flight evaluation and operational suitability testing.

Martin Marietta Corporation shall furnish all resources necessary to procure and fabricate the required materials and components for the assembly and limited acceptance testing of two container lift adapters. Fabrication and assembly shall be in accordance with government-furnished drawings and instructions.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0006, GRADUATE STUDENT RESEARCHERS PROGRAM
Unknown, University of Maryland, College Park Campus, Graduate School, *College Park, Maryland* 20742 (NGT 21-002-810)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

1.0007, AIRCRAFT STABILITY AND CONTROL ANALYSIS AT HIGH ANGLES-OF-ATTACK
R.K. Mehra, Scientific Systems Inc., *1640 Massachusetts Ave., Cambridge, Massachusetts* 02138 (DN675668; N00014-79-C-0705)

At high angles-of-attack, the flying qualities of most high performance aircraft deteriorate due to undesirable characteristics such as pitch-up, roll coupling, wing rock, and directional divergence. These characteristics significantly reduce tracking capability and maneuverability, and often lead to loss of aircraft control. This program will develop an analytical framework of

study for this flight regime, and identify designs of departure preventing control systems. The analysis is based on the bifurcation and catastrophe theory methodology (BACTM).

Utilizing six-degree-of-freedom equations of motion and a fighter aircraft model equilibrium and bifurcation surfaces will be generated for the stall/spin flight regime. Aircraft flight test data will be used to verify the resultant surfaces as functions of aircraft control parameters. The theory will be applied to spin equations of motion to investigate the cause of post stall divergence, and techniques for spin prevention and recovery will be investigated. Simulation tests will be conducted to validate high angle-of-attack control techniques and test out the spin prevention and recovery techniques which are developed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0008, COMPUTER TOMOGRAPHY OF FLOWS EXTERNAL TO TEST MODELS

C.M. Vest, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Mechanical Engineering, *Ann Arbor, Michigan* 48104 (NAG 2-118)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0009, INTEGRATED FLIGHT/WEAPON CONTROL SYSTEM (IFWC)

W.J. Murphy, McDonnell Douglas Astronautics Co., *E. 411 St., St. Louis, Missouri* 63166 (DF143570; F33615-79-C-3604)

This work unit supports the development of proposed new weapon platform control system technologies. This program will impact the problem encountered by pilots of tactical aircraft in achieving proper launch envelopes for guided weapons. The objective is to design and test automatic and semi-automatic flight control systems which will fly the attacking aircraft to the required launch envelopes for guided weapons. This system will improve the accuracy of the weapon system, reduce pilot workload needed to launch the weapon, and increase survivability of the fighter weapon system.

The contractor will select a state-of-the-art baseline fighter. Using this baseline fighter and selected aa and as guided weapons, the contractor will develop an IFWC system capable of increasing the chances of success and survival. Finally, he will evaluate the system using an engineering simulation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0010, NEAR- AND FAR-FIELD RADIATION FOR DUCTS USING A FINITE AND INFINITE ELEMENT APPROACH

W. Eversman, University of Missouri, Rolla Campus, School of Engineering, Dept. of Aerospace Engineering, *Rolla, Missouri* 65401 (NAG 1-198)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0011, INVESTIGATION OF WEIGHT PENALTY FOR HYDROFLUIDIC BACK-UP FLIGHT CONTROLS

J. Leonard, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN890293; N00019-80-C-0290)

The technical objective is to investigate and determine the weight penalty of a hydro-fluidic back-up flight control system compared to other candidate back-up control systems.

The contractor will conduct a technical investigation of the weight penalty, if any, for the back-up flight control system proposed for the V/STOL 'B' aircraft. This investigation will compare several candidate systems, their components, and their configurations. A determination will be made and recommendations for a back-up system will be presented.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0012, V/STOL TECHNOLOGY REQUIREMENTS FOR FUTURE FIGHTER AIRCRAFT

G. Lind, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DF144210; F33615-79-C-3024)

This effort will explore the viability of design and technology integration of a single V/STOL concept to accomplish the close air support/battlefield interdiction mission using the STOL mode and to accomplish the counter air/air superiority mission using the VTOL mode. Results of recent studies have shown that V/STOL aircraft are well suited to conduct of the close air support and counter air mission requirements during the 1990's, and that runway damage (during future conflicts) may negate the use of conventional takeoff and landing aircraft. The objective of this effort is to determine if a single V/STOL concept can be designed to achieve air superiority independent of runways and to conduct ground support operations from short undamaged portions of the runway.

This effort will concentrate on the European theater of operations in the 1990 time period. Merits of the selected V/STOL concept are to be evaluated against conventional takeoff and landing (CTOL) baseline designs dedicated to the mission. Specific factors requiring analysis and evaluation include effectiveness (sortie rates, bombs on target, kill ratio, etc.), costs, technology risk, operations flexibility and survivability. In addition, identification of required technology development, technology gaps and areas of required emphasis will be defined for the V/STOL concept.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0013, THE EFFECTS OF SUPERSONIC JET SCREECH TONE REDUCTION ON BROADBAND SHOCK-ASSOCIATED NOISE

R.T. Nagel, University of North Carolina, North Carolina State University, Graduate School, *Raleigh, North Carolina* 27607 (NAG 3-189)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0014, COMPRESSIBLE SUBCRITICAL AIRFOIL DESIGN AND TEST

G.M. Gregorek, Ohio State University Research Foundation, *1314 Kinnear Rd., Columbus, Ohio* 43212 (DF141270; AFOSR-78-3476)

This work unit supports the development of advanced USAF high-altitude long-endurance aircraft. Presently, high-altitude long-endurance aircraft used for military missions are limited in altitude and payload capability. Advanced technology airfoils will help alleviate these lifting surface associated problems. This work effort is the design and wind tunnel test of compressible subcritical airfoils for future USAF aircraft, using a previously developed airfoil methodology. Use of these advanced technology airfoils will permit flight envelop expansion on future military high-altitude long-endurance air vehicles.

A compressible inverse airfoil design procedure developed for AFFDL/FXM will be used to configure several high performance airfoils for high-altitude long-endurance aircraft applications. The most promising of these designs will be tested two-dimensionally in the Ohio State University transonic wind tunnel facility.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0015, THERMALLY CONTROLLED BOUNDARY LAYER TECHNOLOGY

J.D. Lee, Ohio State University Research Foundation, *1314 Kinnear Rd., Columbus, Ohio* 43212 (DF143230; F33615-79-C-3008)

The Air Force function for this effort is the design of future large aircraft, transports and bombers. The problem this effort addresses is the need to reduce the drag on these aircraft so that either the range can be extended or fuel required for a given mission reduced. The objective is to demonstrate the ability of cryogenic cooling of an airfoil surface to delay transition of the boundary layer and thereby reduce drag. The results of

this study will contribute to the Air Force's fuel conservation effort.

This effort will first involve the design and construction of a simple low cost wind tunnel model to demonstrate the effect of boundary layer cooling on an airfoil. This model will then be tested in a wind tunnel and the results used to verify or modify existing theory.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0016, STRUCTURAL TESTING OF COMPOSITE PANELS

P.J. Conrad, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF146220)

Structural strength, integrity and minimum weight are of (paramount) importance in the design and analysis of aerospace vehicles to insure that they perform the intended mission. The objective of this effort is to develop experimental and analytical techniques to determine the buckling and postbuckling strength of stiffened and unstiffened composite panels. This will directly support the analysis and design of structures for strategic, tactical and training aerospace vehicles. The successful accomplishment of this effort will provide reliable analytical and experimental data for the design of aerospace systems.

The flat, curved, stiffened and unstiffened advanced composite panels will be fabricated, tested and analyzed under different loading and boundary conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, INVESTIGATION OF SIDESTICK CONTROLLER DYNAMICS

T.J. Cord, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF144160)

The function or mission supported by this work unit is the updating of military flying quality requirements contained in MIL-F-8785B, specifically the development of flying qualities design criteria for sidestick-controller dynamics and sidestick-controlled aircraft. The problem area is optimally interfacing the pilot with the controller and aircraft for sidestick-controlled aircraft. The objective is to assemble a data base and to develop sidestick controller and sidestick-controlled aircraft criteria for use in the military flying qualities specification. The military relevancy is to improve the effectiveness of combat aircraft through better pilot/control-stick/aircraft interface characteristics.

The approach to be taken in fulfilling the objective is to assemble the available data base and prepare specification criteria based on these data for inclusion in the new MIL-PRIME-STD for flying qualities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, RCS DESIGN GUIDELINES-AIRCRAFT CONFIGURATION SELECTION FOR RCS CONTROL, MIPRATL 79-7

D.O. Fearnow, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DA0G3411)

To provide aeronautical weapon systems designers with the capability to routinely and confidently design military aircraft with specific levels of radar cross section (RCS). Wherein, the impact on cost, weight, performance, size, configuration, reliability, maintainability, survivability and other pertinent weapon system design features are determined in the concept and/or configuration phase of their design and development cycle.

The program involving the study of RCS-to-performance relationships of four categories of aircraft; (1) bomber, (2) fighters, (3) missiles, and (4) rotary-wing is planned in four tasks: task 1 - RCS data base and guidelines development; task 2 - RCS parametric study; task 3 -performance trade-off methodology; task 4 - final report

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0019, MULTIPLE FRAGMENT IMPACTS ON SINGLE ENGINE AIRCRAFT FUEL SYSTEMS

C.E. Fett, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF138480)

This effort is in direct support of AFFDL/FESE aircraft survivability test programs. The conventional missile warhead is considered a principal threat to aircraft survivability. Despite this fact, only sketchy analytical information on related fragment effects is available. This program will investigate areas on combat aircraft that are highly susceptible to warhead-related fragment impacts/penetrations, in particular the fuel areas. Domestic aircraft vulnerability will also be investigated as well as defense concepts should they be found necessary. Substitute-type structural materials design to enhance survivability/aircraft design will also be investigated. The generated data will be used to disclose high-threat aspects of the fuselage fuel tank areas of domestic aircraft including dry bay areas adjacent to these areas, and defense concepts pertinent to them.

This program will be a multi-year, multi-phased test and evaluation with specific milestones to be met for each phase. During these phases gunfire tests will be performed to determine how penetration and fire probability is effected by various parameters such as dry bay airflow, fragment density and velocity, tank ullage, fuel type, and moldline air-speed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, EVALUATION OF STRUCTURAL FASTENERS FOR INTEGRAL AIRCRAFT FUEL TANKS

J.D. Oetting, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF142870)

This work unit supports the requirement for enhanced fuel tightness in integral fuel tanks for usaf aircraft. MIL-A-8867B is directly supported in the area of fuel tank leak testing and MIL-T-5578 in the area of fuel tank sealing. This effort is directed toward solving the problems of fuel leakage at structural joints. The objective of this program is to screen various fastener systems and evaluate their ability to reduce fuel leaks. The reduction of fuel leak problems will significantly reduce the maintenance costs of USAF aircraft.

Candidate fastener systems will be obtained from vendors and installed in test coupons with recommended fuel sealants. Fuel pressurization chambers will be placed over the area of the fasteners while flight-by-flight loading is being applied to the test coupon. Fuel leak rates will be measured and compared with each candidate fastener system. Recommendations will be made for the procurement of the most qualified systems. The better rated fastener systems will be evaluated for fuel tightness with representative variations in hole preparation, hole size and fastener torque.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, IMPROVEMENT OF PARABOLIZED NAVIER-STOKES SOLVERS FOR SUBSONIC, TRANSONIC, AND SUPERSONIC FLOWS

R.T. Davis, University of Cincinnati, School of Engineering, Dept. of Aerospace Engineering & Applied Mechanics, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (NCA 2-130101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0022, HELICOPTER EXTERNAL LOAD ACQUISITION TECHNOLOGY INVESTIGATION

R. Bowen, Bell Helicopter Textron, *Hwy. 183, P.O. Box 482, Fort Worth, Texas* 76101 (DA0G0478; DAAK51-79-C-0058)

The object of this program is to identify, analyze, and evaluate candidate methods of improving the acquisition of sling and/or netted loads by a hovering helicopter under conditions of poor visibility.

Analyze current procedures and techniques used by military and commercial helicopters for acquiring external sling

loads to determine the need for improved techniques and specialized systems and equipment for accomplishing this task.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0023, V/STOL TECHNOLOGY REQUIREMENTS FOR FUTURE FIGHTER AIRCRAFT
C. Kuchar, General Dynamics Corp., *P.O. Box 748, Fort Worth, Texas* 76101 (DF145390; F33615-79-C-3033)

This effort will explore the viability of design and technology integration of a single V/STOL concept to accomplish the close air support/battlefield interdiction mission using the STOL mode and to accomplish the counter air/air superiority mission using the VTOL mode. Results of recent studies have shown that V/STOL aircraft are well suited to conduct of the close air support and counter air mission requirements during the 1990's, and that runway damage (during future conflicts) may negate the use of conventional takeoff and landing aircraft. The objective of this effort is to determine if a single V/STOL concept can be designed to achieve air superiority independent of runways and to conduct ground support operations from short undamaged portions of the runway.

This effort will concentrate on the European theater of operations in the 1990 time period. Merits of the selected V/STOL concept are to be evaluated against conventional takeoff and landing (CTOL) baseline designs dedicated to the mission. Specific factors requiring analysis and evaluation include effectiveness (sortie rates, bombs on target, kill ratio, etc.), costs, technology risk, operations flexibility and survivability. In addition, identification of required technology development, technology gaps and areas of required emphasis will be defined for the V/STOL concept.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0024, COMPOSITE MATERIAL AIRCRAFT ELECTROMAGNETIC DESIGN GUIDELINES
W.G. Duff, Atlantic Research Corp., *5390 Cherokee Ave., Alexandria, Virginia* 22314 (DN890227; N00019-79-C-0634)

NAVAIR and the Air Force are conducting investigations to characterize composite material electromagnetic vulnerabilities. To date the existing body of knowledge has not been formulated into guidelines readily accessible to aircraft manufacturers.

Approach. Review and evaluate existing data. Formulate into the following tentative chapters: introduction, electromagnetic threats, composite material impact on aircraft vulnerability, intrinsic electrical properties, structural and material properties, external to internal coupling, subsystem and component susceptability, system analysis, system trade-off, measurements, tests and evaluation, protection methods, design guidelines.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0025, HT 80-4, APPLICATION OF FINITE ELEMENT METHODOLOGY TO HELICOPTER COMPOSITE PRIMARY STRUCTURES
N.J. Calapodas, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0G2297)

To determine suitability of different NASTRAN elements for application on dynamics of composite structures. Several elements, such as quad, hexa, etc., will be compared with respect to accuracy and computational cost.

The approach to be used is to acquire an existing composite structure (such as OH-58 and/or AH-1G tailboom), model it using various finite element (FE) configurations, and perform a parametric study regarding the accuracy of dynamic response as a function of element type and number of elements (computational cost). This work will be preceded by obtaining modal parameters from shake test to serve as comparison data.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0026, HT PP 76-12 - INVESTIGATION OF LIFE PREDICTION TECHNOLOGY FOR SMALL TURBINE ENGINES
Unknown, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3833)

To investigate current techniques for determining expected life of small turbine engine components; to identify existing voids in technology which, if filled, could provide the Army and industry with more reliable and effective life prediction tools. This investigation could result in further work to pursue improved life prediction techniques and allow better component design capability for particular mission requirements, longer mean-time-between-overhauls with equivalent flight safety, and reduction of total engine hardware required.

Utilizing information from the literature, government and industry, this program will investigate various stress analysis theories (2-D, 3-D) and metal temperature calculation techniques from the standpoint of usability, effectiveness and accessibility of computer codes, stress concentration factors and coating effects, etc. And identify potential improvements which could advance life prediction technology. The output of this program will include the current status of life prediction relative to Army needs, for future work, where feasible, to fill the voids in technology.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0027, LIMITING PERFORMANCE OF NONLINEAR SYSTEMS WITH APPLICATIONS TO HELICOPTER VIBRATION CONTROL PROBLEMS (16091-E)
W.D. Pilkey, University of Virginia, School of Engineering & Applied Science, Dept. of Aerospace Engineering, *Thornton Hall, Charlottesville, Virginia* 22901 (DA0G8947; DAAG29-79-G-0015)

To study helicopter vibration control systems both active and passive including rotor isolators. Relevance: This research is very relevant in helicopter technology, also relevant to a variety of other dynamic systems such as engines.

An analytical procedure is set up so that some index of performance is extremized subject to some constraint functions. Mathematical programming techniques are used to effect a solution.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

1.0028, MEASUREMENT OF DISPLACEMENT AROUND HOLES IN COMPOSITE PLATES SUBJECTED TO QUASI-STATIC COMPRESSION
J.C. Duke, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Engineering Science & Mechanics, *Blacksburg, Virginia* 24061 (NAG 1-193)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0029, COMPRESSION STRENGTH FAILURE MECHANISMS IN UNDIRECTIONAL COMPOSITE LAMINATES CONTAINING A HOLE
E.R. Johnson, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Engineering Science & Mechanics, *Blacksburg, Virginia* 24061 (NAG 1-201)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0030, AIRCRAFT DIGITAL INPUT CONTROLLED HYDRAULIC ACTUATION AND CONTROL SYSTEM
G. Raymond, Boeing Co., *7555 E. Marginal Way S., P.O. Box 3999, Seattle, Washington* 98124 (DF461320; F33615-77-C-2034)

The objective of this program is to establish and demonstrate hydraulic actuation system techniques that respond directly to digital input commands. The techniques will be applicable to continuous duty actuation functions such as air induction,

engine inlet vanes, engine after-burner nozzles and flight controls.

A potential DEHA-aircraft application will be selected aimed at establishing performance and design criteria. An analysis of promising advanced hydraulic actuation techniques implementing multimode electronic digital inputs, will be conducted to establish its applicability to future aircraft. Based on these results, a full scale DEHA prototype will be designed, fabricated and tested to verify compliance to performance and durability requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0031, AIRPLANE ACTUATION TRADE STUDY

R. Yurczyk, Boeing Co., *7555 E. Marginal Way S., P.O. Box 3999, Seattle, Washington* 98124 (DF144760; F33615-79-C-3630)

This effort addresses the life cycle cost of control actuation on future military aircraft. Control power management will be essential on future aircraft. Hydraulic actuation contributes significantly to the cost of flight control systems and makes effective control power management difficult. The objective of this program is to assess the benefits of expanding the electrical power system on fly-by-wire aircraft to also do control actuation, i.e., power-by-wire aircraft. This effort will quantify the credibility and benefits that can be realized with power-by-wire actuation such that future flight control system developments can be based on a more substantial data base.

Select a point of reference existing design. Redesign the airplane to do all actuation electrically instead of hydraulically. Redesign the total electrical power generation, distribution, and utilization system accordingly with special emphasis on power control techniques. Compare this all electric system with the conventional split secondary power system which uses hydraulics for actuation. Assume a 1990 technology time frame. Make comparisons of the all electric system with the conventional electric-hydraulic system on the basis of life cycle costs, performance, reliability, and growth potential for the future.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0032, EDGE FUNCTION ANALYSIS

P.M. Quinlan, National University of Ireland, University College at Cork, *College Rd., Cork, Ireland* (DF289830; AFOSR-79-0075)

AF function - structural design/analysis of aerospace vehicles. Deficiency - present inability to mathematically represent large structural sections in an efficient inexpensive fashion present analysis methods are applied primarily to structural details and areas of high stress concentration. How research contributes - it will improve the accuracy and lower the cost of structural analyses for aerospace vehicles.

Professor Quinlan is developing the edge function method for structural analysis methods applicable to aircraft wing structures and star-shaped propellant grains. In addition to his own research, he has access to data from other agencies and institutions on the application of EFM to specific areas such as vibration, thick plate and fracture problems. His recent advances in 3-D stress analysis will be extended to include ellipsoidal-shaped cavities in prismoidal bodies. He will also apply the EFM to vibrations in isotropic, orthotropic and geolotropic plates. He will visit USAF installations to conduct seminars and provide consultative guidance to structural design scientists.

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, CARBORANE BURNING RATE MODIFIERS FOR SOLID PROPELLANTS

W.E. Hill, Auburn University, School of Arts & Sciences, Dept. of Chemistry, *Auburn, Alabama* 36830 (DN590853; N00024-75-C-5318)

To perform research on carborane compounds for use as propellant burning rate catalysts. Three main problems will be investigated; (1) possibility of migration from the propellant, (2) undesirably high-melting points, and (3) low-yield synthesis.

To prevent migration, existing binders will be modified by using carboranyl plasticizers which react with double bonds of the polymers on curing. Hydroxy-terminated polybutadiene (HTPB) and carboxy-terminated polybutadiene (CTPB) polymers will be reacted with functional carboranes to make polymers containing boron which should not migrate easily. Silyl carboranes containing Si-Si bonds or Si-C bonds will be synthesized. These compounds should yield high burning rates with less carborane which should be less volatile. Difunctional carboranyl isocyanates and epoxides for use as curing agents will be synthesized. What effect a Lewis base has on the reaction rate activation energy and yield of ortho carborane will be determined. Carboranes will be synthesized from acetylenes for improved yield.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Sea Systems Command

3.0002, HYDROGEN EMBRITTLEMENT IN CU-NI ALLOYS

J.H. Davis, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics, *Huntsville, Alabama* 35807 (NAS 8-33811)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

3.0003, CONDUCTIVITY AND CHARGE STORAGE PROPERTIES OF INSULATING MATERIALS

J. Wilkenfeld, International Research & Technology Corp., *P.O. Box 80817, San Diego, California* 92138 (DF903240; F19628-77-C-0245)

AF function surveillance and communications. Deficiency communications satellites (DSCS) have displayed erratic electronic behavior soon after being placed in orbit. It has been determined that at least some of the observed malfunctions could be due to electrical breakdown in insulating materials caused by the effects of electrons present in the region of satellite orbits. Objective is to obtain theoretical and/or empirical models of charge storage in satellite materials exposed to space radiation environments. How research contributes the information to be obtained will contribute to improved satellite designs that minimize malfunctions due to space radiation-induced electrical breakdown.

Previously obtained empirical data on the charge storage properties of insulation will be used to refine existing models or develop new theoretical models that can be used to compute the responses of these materials to a synchronous orbit space environment. Additional experimental measurements will be performed as needed to refine or test the models.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

3.0004, PHOTOELECTRON SPECTROSCOPY OF LOW WORK FUNCTION SURFACE LAYERS

C.W. Bates, Stanford University, School of Engineering, Dept. of Materials Science & Engineering, *Stanford, California* 94305 (ECS79-09453)

The electronic properties of photoemitting surfaces are under investigation with the objective of developing sufficient understanding of the relationship between emission processes and surface structure to point the way toward possible development of new cathode materials. Surfaces being studied include those of standard cesiated visible (S-20), infrared (S-17), and gallium arsenide negative affinity cathode materials. The gallium arsenide-oxygen-cesium surface is also being studied with the specific goal of determining the cesium-oxygen ratio that provides the lowest work function surface. Both X-ray and ultra-

violet photo-electron spectroscopy are used in the studies. Spectral yield and threshold photoemission studies are being performed as part of the investigation.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering, Div. of Electrical Computer & Systems Engineering

3.0005, CHEMICAL AND MICROSTRUCTURAL CHARACTERIZATION OF NOBLE METAL PARTICLES HIGHLY DISPERSED ON MODEL SUPPORTS

M. Boudart, Stanford University, School of Engineering, Dept. of Chemical Engineering, *Stanford, California* 94305 (NCA 2-745105)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0006, DEVELOPMENT OF AN AIR SAMPLING AND ANALYTICAL METHOD FOR 1,6 HEXAMETHYLENEDIISOCYANATE

S.M. Rappaport, University of California, Berkeley Campus, Graduate School, *2200 University Ave., Berkeley, California* 94720 (DF057810; AFOSR-80-0113)

AF function - the Air Force uses large amounts of polyurethane paints and foams for aircraft maintenance. These paints contain large amounts of aliphatic and aromatic diisocyanates which may pose a severe occupational hazard to maintenance personnel. Deficiency - there are currently no reliable methods available for monitoring airborne exposures to diisocyanates. Objective - the objective of this research is to develop an air sampling and analytical method for detection of low levels of 1, 6, hexamethylenediisocyanate (HDI). How research contributes- the research will provide a required field method for sampling and analyzing airborne diisocyanates and will provide significant benefits to the Air Force Occupational Safety and Health Program.

A laser employing a phase conjugate mirror in its resonator will be set up and studied under steady state conditions. A prime experimental candidate is a dye laser with degenerate four-wave mixing to supply the phase conjugate reflection. Effects of coupling and of phase distortion on the output beam brightness and mode structure will be analyzed and compared with theory.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0007, CHEMICAL DYNAMICS STUDIES

B.H. Mahan, University of California, Berkeley Campus, Lawrence Berkeley Lab., *Berkeley, California* 94720 (005954 TICNO; 4012)

The purpose of this study is derivation of fundamental and practical information about chemical dynamics from the study of collision processes which involve ions, molecules, and photons in the gas phase. Methods of predicting the rates of chemical reactions, energy transfer processes, collisional dissociations, collisional ionization and charge transfer processes, using as primary information the electronic energy states of the reactants, products, and intermediates are studied. Prediction of the kinetic behavior of complex systems; reactive and non-reactive scattering of hydrogen of a number of ions that appear prominently as contaminants in hydrogen plasmas, and rapid and economical estimation of the energy distributions of the products of some classes of reactions are areas of study. To calculate the equilibrium properties of high-temperature ionized gases, the electronic states, vibration frequencies, and geometries of small molecular ions must be known. To acquire this information, a unique apparatus designed to obtain the electronic spectra of mass identified gaseous ions by laser-induced fluorescence has been constructed and operated successfully. The spectral information obtained with this apparatus will be of value in flame and plasma diagnostic experiments, and the structural information deduced from the spectra will also be applied to the general problem of the connection between molecular structure and chemical reactivity.

SUPPORTED BY U.S. Dept. of Energy, Office of Energy Research

3.0008, IGNITION PROPERTIES OF ANTI-MISTING FUELS

E.A. Grens, University of California, Berkeley Campus, School of Letters & Science, Dept. of Chemistry, *Berkeley, California* 94720 (NCC 2-140)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0009, BASIC IMPROVEMENTS IN SUBSTRATE InP MATERIAL (16041-EL)

S.B. Hyder, Varian Associates Inc., *611 Hansen Way, Palo Alto, California* 94303 (DA0G8991; DAAG29-79-C-0009)

To study growth parameters and processes which lead to high quality of indium phosphide single crystals. Relevance: InP is a promising material for active high-frequency devices (in excess of 20GHz) and for electro-optical applications such as photocathodes or photodiodes.

Emphasis will be placed on growth, characterization, and physical chemistry of high throughput, high-pressure pullers for polycrystalline and single crystal material. Sources of defects and precipitates will be studied and eliminated.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0010, CORRELATION OF DEFORMATION MECHANISMS AND SOURCES OF ACOUSTIC EMISSION OPERATIVE DURING DEFORMATION OF CRYSTALLINE MATERIALS

S.H. Carpenter, University of Denver, School of Engineering, Dept. of Metallurgy, *2115 S. University Blvd., Denver, Colorado* 80210 (DMR77-23782)

This is a continuation of an investigation to identify sources of acoustic emission operative during mechanical deformation of metallic materials. In addition to acoustic emission data, the mechanical damping and modulus defect are independently and simultaneously measured. The data obtained are used to establish correlations between particular emission characteristics and particular sources and deformation mechanisms for well-characterized metallic materials. This is a renewal of NSF Grant DMR73-02382 A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0011, DETECTION OF MATRIX STRESSES IN GRAPHITE/EPOXY COMPOSITES

P.K. Predecki, University of Denver, School of Engineering, Dept. of Chemical Engineering & Metallurgy, *2115 S. University Blvd., Denver, Colorado* 80210 (DF048180; AFOSR-77-3284)

AF function - the function of nondestructive evaluation (NDE) in the Air Force is to save lives and resources through timely examination of aircraft and engine components to assure their continued safe operation. Deficiency - many inspection techniques have been developed for metals, however, despite the increasing use of polymer composites, there has not been an adequate development of NDE techniques for these materials. Objective - the objective of this work unit is to conduct research on the detection of matrix stresses in graphite/epoxy composites by NDE techniques. How work contributes - matrix stresses are indicative of the soundness of the composite and indicate degradation such as debonding, fiber breakage, and humidity infiltration.

A new application of x-ray stress analysis for detecting residual and applied stresses in the matrix of graphite-epoxy composites will be investigated. The method makes use of small amounts (less than 20 wt percent) of crystalline filler placed in the matrix of any desired ply or plies during the fabrication process.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0012, SUPERCONDUCTING AND NOVEL MATERIALS

C.M. Falco, U.S. Dept. of Energy, Argonne National Lab., *9700 S. Cass Ave., Argonne, Illinois* 60439 (005321 TICNO; 58904)

This program is devoted to a study of a wide variety of unusual materials and the characterization of their lattice, electronic and magnetic properties. The primary methodologies utilized are electron tunneling techniques and the measurement of transport properties. Sophisticated preparation techniques for the production of novel materials are available. The major areas of current emphasis are: (1) properties and applications of superconducting materials, especially in nonequilibrium states; (2) preparation and characterization of materials that do not occur naturally, such as the layered ultrathin coherent structures (LUCS) obtained by sequential sputtering of dissimilar materials; (3) studies of phase transitions in two-dimensional superconductors; and (4) development and investigation of Josephson junctions in high-transition temperature superconductors.

BIBLIOGRAPHIC REFERENCES: Gray, K.E., T. Lenihan and J. Tarczon, Thin Film Superconducting Switches, IEEE Trans. MAG-15 (1): 175-177 (Jan 1979). Schuller, I., and C. Falco, Optically Induced Non-Equilibrium and Heating Effects in Superconductors, Sov. Phys. - J. Low Temp. Phys. 4: 446 (1979).

SUPPORTED BY U.S. Dept. of Energy, Office of Energy Research

3.0013, ION-ION NEUTRALIZATION PROCESSES AND THEIR CONSEQUENCES (16945-C)

R.S. Berry, University of Chicago, School of Physical Sciences, Dept. of Chemistry, *5734 S. Ellis Ave., c/o Hinds Geophysics Lab., Chicago, Illinois* 60637 (DA0G2972; DAAG29-80-K-0016)

To investigate the recent observations of intense light emission from atoms, the light amplification by atom-rare gas excimers, and the newly-discovered quasiperiodic atomic emission, all from near-resonant ion-ion neutralization in an inverted population distribution. Relevance: This research has relevance to lasers and directed energy source programs of the Army. In particular it has the possibility of leading to the development of excimer lasers in the visible.

The work will be carried out using an available merged-ion-beam system. Shock-tube studies will be supported by computer modeling of the pulsed and the oscillatory process.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0014, NMR STUDY OF VISCOELASTIC FLUIDS AND ELASTOMERS UNDER EXTREME CONDITIONS OF TEMPERATURE AND PRESSURE

J. Jonas, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Chemistry & Chemical Engineering, *106 Engineering Hall, Urbana, Illinois* 61801 (DF046940; AFOSR-77-3185)

AF function - advanced aircraft systems employ viscoelastic fluids, elastomers and amorphous polymers as elastohydrodynamic lubricants, sealants, fuels and matrices which are subject to operation at high pressures and temperatures. Deficiency - the basic principles and parameters governing the behavior of viscoelastic fluids and materials, their dependence upon temperature and pressure and their correlations with molecular structure are not understood. Objective - using nuclear magnetic resonance relaxation techniques the dynamic structure of viscoelastic materials and fluids will be studied over wide ranges of temperature, pressure and viscosity. How work contributes - it is expected that this research will establish molecular structure-property relationships which can be utilized to predict and improve the life expectancy of viscoelastic fluids and materials for operational and future aircraft.

Systematic studies shall be conducted on (1) NMR relaxation characterization and concurrent shear viscosity measurements of fluorosilicone and fluorosiloxane elastomers for integral fuel tank sealants as a function of temperature and pressure, (2) model systems to determine the effects of molecular structure on the dynamic behavior, shear viscosity, and glass transition of amorphous materials, to test current theoretical models for the glass transition, and to elucidate problems related to glass transition in amorphous materials of Air Force interest, and (3) liquid crystalline structure and mesophase phenomena in organic and inorganic materials.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0015, THEORETICAL STUDIES OF MOLECULAR RELAXATION

D.J. Diestler, Purdue University, School of Science, Dept. of Chemistry, *Executive Bldg., West Lafayette, Indiana* 47907 (CHE77-23717)

A two-part theoretical study of molecular relaxation will be pursued: (A) bimolecular collisions in dilute gases; (B) vibrational relaxation of small molecules in dense media.

In part (A) procedures for computing cross sections for collision-induced dissociation (CID) of a diatomic molecule by an atom will be developed and applied. The approach will be to solve the relevant time-independent Schrodinger equation by the close-coupling method. The key idea is to replace the true two-body continuum of the diatomic molecule by a discrete representation thereof, which, in turn, leads to a discrete set of close-coupled equations. Several techniques of discretization will be explored. The Lippmann-Schwinger equation for non-dissociative bimolecular collisions will be solved by a generalization of these techniques. In this case the continuum of the relative translational motion is to be discretized.

In part (B) the molecular mechanisms of vibrational energy relaxation of small molecules in condensed media will be investigated. Models which lead to closed expressions for the relaxation rate constant exhibiting explicit dependences upon microscopic properties (of both molecule and medium) will be developed and explored. The dynamical participation of 'local' modes of the medium which are strongly coupled to the vibrational coordinate of the relaxing molecule will be properly accounted for. In particular, the role of local translational and orientational motions in the vibrational relaxation of diatomic molecules isolated in rare-gas solids will be examined.

This is a continuation of research primarily supported under NSF grant CHE-7417485.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0016, WORKSHOP ON CARBOHYDRATE SYNTHESIS

C. Ponnamparuma, University of Maryland, College Park Campus, Graduate School, Dept. of Chemistry, *College Park, Maryland* 20742 (NAGW 219)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

3.0017, THE VOYAGER MISSION - IMPLICATIONS FOR PLANETARY BIOLOGY

C. Ponnamperuma, University of Maryland, College Park Campus, Graduate School, Dept. of Chemistry, *College Park, Maryland* 20742 (NAGW 226)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

3.0018, PREPARATION AND STUDY OF HIGHLY REACTIVE METAL POWDERS (15255-C)

R.D. Rieke, University of Nebraska, Lincoln Campus, School of Arts & Sciences, Dept. of Chemistry, *Lincoln, Nebraska* 68508 (DA0F9102; DAAG29-78-G-0007)

To determine the scope and limitations of a new technique for generating metal powders in a finely divided and highly reactive state; to establish the modes of reactivity. Relevance: Reactive metals are used in rocket propellants, in explosive and pyrotechnic formulations. Certain basic synthetic procedures have been accomplished in a direct fashion only since the discovery of the subject process.

Main group and transition metal salts will be reduced with molten potassium metal in inert solvents; the effect of crown ethers will be explored.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0019, ELECTRONIC SPECTROSCOPY

D.S. McClure, Princeton University, Graduate School, Dept. of Chemistry, *205 Nassau Hall, Princeton, New Jersey* 08540 (CHE79-12427)

This research is in the area of quantum chemistry. Dr. McClure intends to continue and expand a program of research involving photoionization and photochemistry. His recent work on the high-energy levels of transition metal ions in crystals has led to his current interest in the photoionization thresholds of ions in crystals. In new work in this area he plans to show systematically what factors influence the photoionization energy and to investigate some aspects of the dynamics of photoionization. In recently initiated work on photochemistry of crystals he has made some progress on the understanding of the photoreduction of uranyl ion in uranyl formate monohydrate crystals. New experiments planned or in progress involve the use of single crystals and laser methods. A study of ligand isomerization in ((NH3)5CoNO2)Cl2 and similar salts is under way. The rate of this process has been measured at various temperatures, and the reaction has been found to occur with an appreciable yield at 40K. New experiments with this and similar systems will also involve single crystals and the dye laser. This research represents a continuation of that currently supported by Foundation grant CHE7618432.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0020, QUANTUM CHEMICAL STUDY OF METHANE OXIDATION SPECIES

C.F. Jackels, Wake Forest University, School of Arts & Sciences, Dept. of Chemistry, *Reynolda Station, Winston Salem, North Carolina* 27109 (NCC 1-55)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

3.0021, GROWTH OF DIAMOND-LIKE CARBON FILMS FOR ELECTRONIC APPLICATION

J.C. Angus, Case Western Reserve University, School of Engineering, Dept. of Chemical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAG 3-191)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0022, GAS TURBINE DEMONSTRATION OF PYROLYSIS-DERIVED FUELS

G.B. Jasas, Teledyne CAE, *1330 Laskey Rd., Toledo, Ohio* 43612 (003681 TICNO; Acct. No. 1256)

The objective of this program is to conduct engineering analysis and tests which demonstrate the feasibility of using pyrolytic oil and char as a fuel in a combustion turbine engine. A production Teledyne CAE J69 turbojet engine with a modified combustion system is to be used as the demonstration vehicle. The technical approach consists of four tasks time-phased over a 20-month contractual effort and includes: analysis of pyrolytic fuel combustion, storage/handling effects on materials, and procurement of test hardware; bench and sub-component testing to define pyrolytic fuel chemical and physical properties, compatibility with flow handling equipment, and fuel injection system performance; and rig testing full scale combustor to optimize performance with pyrolytic fuel, measure emissions, and define modifications prior to engine demonstration. The results of this project will contribute to the technology required to commercialize pyrolysis-derived fuel burning in small-scale turbine applications and thereby provide a substitute fuel for premium petroleum and natural gas fuels.

SUPPORTED BY U.S. Dept. of Energy, Div. of Fossil Fuel Utilization

3.0023, PRINCIPLES OF GRINDING AND DISPERSING AMMONIUM PERCHLORATE (17086-C)

F.M. Fowkes, Lehigh University, School of Arts & Sciences, Dept. of Chemistry, *Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (DA0G0396; DAAG29-79-C-0207)

To study the surface and colloid chemistry of very small particles of ammonium perchlorate (AP) in order to effect a more reproducible burning rate in perchlorate propellants. Relevance: This reseach is relevant to solid propellant development projects, particularly in high burning rate compositions.

Suitable reagents will be investigated which can be adsorbed from Freon 113 during grinding of AP and then react on the AP forming a cross-linked surface capable of later bonding into the binder system.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0024, TERRESTRIAL RADIOISOTOPE APPLICATIONS DEVELOPMENT

F.N. Case, U.S. Dept. of Energy, Oak Ridge National Lab., *P.O. Box X, Oak Ridge Operations Office, Oak Ridge, Tennessee* 37830 (004255 TICNO; 01367(27))

This task provides development and technical support for the use of byproduct radionuclides in those applications where radiation, heat, or other unique properties of materials recovered from nuclear wastes can be used to conserve energy or natural resources, contribute to the long-term management of nuclear waste, and provide economic or national security benefits. The major near-term objectives of this task are the development, fabrication, and characterization of 137Cs compounds having low solubility in water and development, fabrication, and characterization of 85Kr light sources for use as runway markers on remotely located military airfields. The unique facilities and expertise available at ORNL are required to efficiently perform these tasks. Other subtasks include technical support to DOE and their contractors on 90Sr heat source technology, recovery and utilization of fission-products precious metals, general 85Kr gas utilization, and radiation treatment of noxious materials.

SUPPORTED BY U.S. Dept. of Energy, Office of Policy & Evaluation, Office of Nuclear Energy

3.0025, SOLAR-POLAR MISSION MATERIALS SUPPORT

R.L. Heestand, U.S. Dept. of Energy, Oak Ridge National Lab., *P.O. Box X, Oak Ridge Operations Office, Oak Ridge, Tennessee* 37830 (004252 TICNO; 02313(11))

This task provides the fabrication development, characterization, and supply of test components required for the development and design verification of the General Purpose Heat Source (GPHS) and Thermoelectric Converter for the 1983 Solar-Polar space mission. The scope of this task includes the following subtasks: (1) iridium alloy cladding characterization and supply of test materials for design verification of GPHS; (2) development and characterization of CBCF thermal insulation for GPHS along with supply of test materials for design verification; (3) determination of physical properties of GPHS components; and (4) characterization and analysis of thermoelectric converter materials.

SUPPORTED BY U.S. Dept. of Energy, Office of Policy & Evaluation, Office of Nuclear Energy

3.0026, MULTI-ION INTERACTIONS IN NONTRANSITION METALS (16387-P)

R.E. Beissner, Southwest Research Inst., *8500 Culebra Rd., P.O. Drawer 28510, San Antonio, Texas* 78228 (DA0G9055; DAAG29-79-C-0099)

To develop a first-principles thoery of interatomic potentials between point defects and host non-transition metal atoms. Relevance: The research is directly relevant to ongoing work at AMMRC on molecular dynamics calculations of defect structures to determine equilibrium and non-equilibrium properties of defect structures as they affect thermomechanical properties of metals and alloys.

Many-body theoretic methods of physics that use Green's functions in P.I.'s versions of 'multi-ion expansion' will be used. The screening charge densities for and consequent electric field gradients at point defects will be calculated and compared with exprimental data.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0027, THE ROLE OF IMPACT GENERATED SHOCK WAVES CONTRIBUTING TO THE DAMAGE OF COMPOSITE MATERIALS

Unknown, College of William & Mary, Williamsburg College, Graduate School, *Ewell Hall, Williamsburg, Virginia* 23185 (NCC 1-53)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

3.0028, LOW-VELOCITY IMPACT BEHAVIOR OF COMPOSITES

G.L. Goglia, Old Dominion University, School of Engineering, Dept. of Mechanical Engineering & Mechanics, *5201 Hampton Blvd., Norfolk, Virginia* 23508 (NAG 1-196)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

3.0029, INTERDISCIPLINARY RESEARCH AND DEVELOPMENT ON THE EFFECTS OF THE NATURE AND PROPERTIES OF CERAMIC MATERIALS

J.I. Mueller, University of Washington, School of Engineering, Dept. of Mining, Metallurgial & Ceramic Engineering, *206 Guggenheim Hall, Seattle, Washington* 98105 (NAGW 199)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

3.0030, ELECTROMAGNETIC AND ELECTROSTATIC EFFECTS ON COMPOSITE MATERIALS

B. Burrows, United Kingdom Atomic Energy Authority, Culham Lab., *Abingdon, England, United Kingdom* (DN881506; N00421-79-C-0017)

Test program is to measure te electrical screening performance of 20 ply G.E. panels for both attached and nearby strikes. This contract supports work unit YK901, agency accession no. DN 881505 which was terminated 1 Oct 1979.

Attached and nearby strikes will be used. Measurements will be made under various aircraft configurations including all metal vs. metal and composite panels. Measurements of E and H fields within bays will be accomplished as a function of position and direction. Data obtained will be compared to Boeing Company report DI80-20186-4, Vol I (phase II).

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Systems Directorate

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, PHASE II, DEMONSTRATION OF FLUIDIC TECHNOLOGY TO FUEL MANAGEMENT OF A LOW COST RAM JET CONTROL

D.J. Schaffer, Signal Co. Inc., Airesearch Manufacturing Co, *402 S. 36th St., Phoenix, Arizona* 85034 (DN890121; N00019-79-C-0454)

Conduct a hardware demonstration of fluidics technology in the control of fuel requirements for an advanced ram jet engine for propulsion application to the advanced air-to-air interceptor missile (AAAIM).

Following the definition and design of the fuel control system and the critical interfaces during phase I of this project, a complete fuel control system including the interfaces and the remote sensors will be fabricated and tested to determine its capability to meet the fuel control requirements for the advanced ram jet fuel control.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0002, ADAPTABLE WALL WIND TUNNELS FOR V/STOL RESEARCH

W.R. Sears, University of Arizona, School of Engineering, Dept. of Aerospace & Mechanical Engineering, *Tucson, Arizona* 85721 (DN975112; N00014-79-C-0010)

The ability to predict the performance of V/STOL aircraft in the vicinity of the ground and in transitional flight depends critically upon the accuracy of experimental data obtained in wind tunnels. Such data are plagued by uncertain corrections because of the presence of the tunnel constraining walls which interact with the highly deflected, vortical flows. The proposed research will examine the feasibility of the adaptable wall concept - a concept in which measurements made in the flow field far from the model are used in an active loop to control the flow through the walls - to minimize the wall interference effects for V/STOL flight.

To assess the value of the adaptable-wall concept in the V/STOL regime, a study will be undertaken of three-dimensional flows characterized by large lift coefficients (large deflections) and significant wake effect, to determine what the requirments of an adaptable wall tunnel are. Mathematically, the problem is to determine what boundary conditions, enforced in the mid-field of the flow about a real V/STOL configuration, uniquely determine the inner field and assure that it is part of the desired overall flow field. From a practical viewpoint, there are additional questions which must be addressed: what flow variables should be measured and where; what flow variables must be controlled and where to establish the proper boundary conditions accurately and rapidly.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0003, DESIGN AND FABRICATION OF SURFACE ACOUSTICS WAVE DEVICES

C. Yuen, California State University & Colleges, San Jose State University, School of Engineering, Dept. of Electrical Engineering, *Washington Sq., San Jose, California* 95192 (NCC 2-143)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0004, COMMUNICATIONS ATOM-MOLECULE SCATTERING

B. Liu, International Business Machines Corp., Research Laboratory, *Monterey & Cottle Rd., San Jose, California* 95114 (DN975428; N00014-80-C-0663)

Atom-molecule reactive and nonreactive inelastic collisions are two processes which determine the equilibrium concentrations of atomic and molecular species and the internal energy distribution of these species in the atmosphere and gaseous lasers. They are also important processes determining the return to equilibrium of a disturbed atmosphere. Understanding energy deposition in these processes is thus important to naval communications and surveillance and the naval laser program.

The potential surface for the reactive collision of 0 atoms with HCl is being computed. When this is determined, this sur-

face plus the earlier one for ground state 0 plus HCl will be used to study reactive collisions in this system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0005, HIGH-ENERGY EFFICIENT SOLID-STATE LASER SOURCES
R.L. Byer, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (NAG 1-182)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0006, DEVELOPMENT OF TIME-ACCURATE FINITE ELEMENT TECHNIQUES FOR FIRST-ORDER HYPERBOLIC SYSTEMS WITH EMPHASIS ON THE COMPRESSIBLE EULER EQUATIONS
T.R. Hughes, Stanford University, School of Engineering, Dept. of Mechanical Engineering, *Stanford, California* 94305 (NCA 2-745104)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0007, SUB-MICRON JOSEPHSON JUNCTION DETECTOR
E.C. Jelks, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Environmental Sciences Dept., *San Diego, California* 92152 (DN887537)

Build Josephson junction devices more sensitive and reliable than existing ones for use in future electronics systems.

The idea of using the edges of thin films to lay down narrow superconducting strips for making the detector junction will be pursued with the expectation of achieving a 0.1 micrometer linear junction dimension. This technique, which uses conventional photolithography as opposed to more exotic electronic beam and X-ray lithography, promises to increase detector sensitivity by 20 dB. The technique is particularly suited for the fabrication of sensitive gradiometers as well as interference type (J2) logic elements that will be capable of operation in the 10-20 (degree) K range which is currently obtainable with small closed-cycle refrigerators.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

4.0008, SOLID FUEL COMBUSTOR STUDIES
D.W. Netzer, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN898059)

(a) To develop an interior ballistics model for the solid fuel ramjet. (b) Evaluate performance of fuels under various operating conditions and geometries. Relate the obtainable performance and regression rate patterns to cold flow measurements and fundamental fuel characteristics.

Adapt the Spalding PIESTEP II and Champion 2/E/FIX computer codes to the solid fuel ramjet configuration and environment. Validate model with existing experimental data. Determine flow field characteristics for various inlet and aft dump geometries using pressure taps, pitot rakes and hot wire anemometry in a nonreacting environment. Determine fuel characteristics using differential thermal analysis and gas chromatography. Relate flow field and fuel characteristics to obtainable combustion efficiency and fuel regression pattern for fuels of various composition.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Weapons Center

4.0009, GRADUATE STUDENT RESEARCHERS PROGRAM
D.M. Auslander, University of California, Berkeley Campus, School of Engineering, Dept. of Civil Engineering, *Berkeley, California* 94720 (NGT 05-003-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0010, WEAPONRY - THEORY AND SIMULATION OF INSTABILITIES AND NONEQUILIBRIUM PROCESS IN PLASMAS
C.K. Birdsall, University of California, Berkeley Campus, School of Engineering, Dept. of Electrical Engineering & Computer Sciences, *Berkeley, California* 94720 (DN775746; N00014-77-C-0578)

The objective is to improve understanding of plasma instabilities and nonequilibrium processes in plasma systems for potential naval application of directed energy systems, weapons effects and simulation, and communication systems. Specifically, this includes work on plasma boundaries, limiting currents and related instabilities, and charged particle scattering in rippled, periodic magnetic fields.

The approach is to combine zero-order theory (equilibria), first-order theory (waves, oscillations, instability growth rates), and approximate nonlinear theory with computer simulations in order to gain a better understanding of plasma behavior associated with equilibria, flows, instabilities, heating, and diffusion. Particle and fluid simulation models are developed to study (1) plasma behavior with steep density and field gradients at plasma boundaries; (2) the behavior subsequent to instability of charge or current limited vacuum and plasma models; and (3) charged particle scattering in rippled, periodic magnetic fields.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0011, COMMUNICATIONS - ELECTROSTATIC ACCELERATOR FREE ELECTRON LASER
L. Elias, University of California, Santa Barbara Campus, Graduate School, *Santa Barbara, California* 93106 (DN075442; N00014-80-C-0308)

The objective of this work unit is to design and construct a free electron laser using an electrostatic accelerator. Completion of this objective will result in a flexible experimental system capable of investigating various aspects of free electron lasers. These results will contribute to development of high-energy laser systems applicable to Navy requirements for optical communication, countermeasures, and weapons.

To accomplish the proposed objective, an electrostatic accelerator capable of operating at 1 to 2 amperes at 3mV continuously will be designed and constructed. The electron beam generation, transport, and collection will be tested, initially using 10 microsecond current pulses at a repetition rate of 1000 PPS. A periodic magnetic wiggler and an optical resonator system will be designed and constructed for use with the electrostatic accelerator to generate electromagnetic radiation in the submillimeter wave length range.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0012, MATERIAL SUPPORT TECHNOLOGY - HIGH FIELD IN ELECTRON TRANSPORT IN SEMICONDUCTORS
D.K. Ferry, Colorado State University, School of Engineering, Dept. of Electrical Engineering, *Fort Collins, Colorado* 80523 (DN875150; N00014-78-C-0124)

Improvement in or development of new electron devices for Navy electronics systems will require better understanding of the basic interactions of electric-field-driven electrons with the device material. Electron transport in advanced wide-bandgap semiconductors and insulators and in the interfacial region formed at the joining of two solid materials needs to be investigated.

High field transport of carriers in semiconductors will be studied theoretically and experimentally. There are four separate problem areas: (1) a theoretical study of the transport in the quasi-two dimensional system such as the quantized inversion layer in MOS silicon devices, which will explore the scattering mechanisms in a two-dimensional electron gas and the effects of a nearly amorphous dielectric; (2) a combined theoretical and experimental study in wide bandgap semiconductors such as silicon dioxide and silicon carbide. Silicon carbide has great potential for applications to high-temperature electronics, but many properties must be evaluated; (3) pico-second optical pulses will excite fast electrons which lose energy to the lattice phonons.

These interactions will be clarified in concept, and electron-phonon interaction strengths determined; (4) scattering mechanisms will be studied theoretically and experimentally in mixed crystal ternary and quaternary semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0013, CONTAINERLESS HIGH-TEMPERATURE PROPERTY MEASUREMENTS BY ATOMIC FLUORESCENCE

P.G. Nordine, Yale University, School of Engineering, Dept. of Engineering & Applied Science, *206 Elm, New Haven, Connecticut* 06520 (NAS 8-34383)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

4.0014, DIGITAL ELECTRONIC CONTROL SYSTEM RELIABILITY (FULL-AUTHORITY, FAULT-TOLERANT EEC)

M. McGlone, United Technologies Corp., *P.O. Box 2691, West Palm Beach, Florida* 33402 (DF464440; F33615-79-C-2082)

This is a dual award contract to evolve design guidance with respect to one facet of the reliability/availability/integrity issue associated with the future development of digital electronic engine control systems: that of providing for very high reliability through the use of redundancy/fault-tolerance, tailored to the needs of variable cycle engine control and optimized with respect to the reliability of the system (and of its components) and to cost-of-ownership.

Employ the services of two contractors: one skilled in the synthesis of very high-reliability, fault-tolerant digital computer systems, and the other skilled in the synthesis of control systems for the engine of high-performance military combat aircraft. Require that they work together closely in a program of study and analysis to produce design guidance needed for the future development of full-authority, fault-tolerant (digital) electronic engine control systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0015, DEVELOPMENT OF THE INTEGRATED INSTALLATION NOISE CONTOUR SYSTEM (INCS)

A.J. Averbuch, U.S. Dept. of Defense, Army, Corps of Engineers, Construction Engineering Research Lab., *Interstate Research Park, P.O. Box 4005, Champaign, Illinois* 61820 (DA0V8127)

To develop methods for the facilities engineers and districts to quantitatively predict the noise pollution impact of all major Army operations, including armor, artillery and EOD operations, helicopter operations, small arms ranges, fixed-wing aircraft support operations, vehicular sources, and industrial plants on the civilian and military populations. The prediction will be in the form of 'equal noisiness' l sub DN contours as suggested by the federal EPA and the National Academy of Science to be overlayed on area land use maps as well as the base master plan. User manuals and computer programs will be the products of this research which will yield the integrated installation noise contour system (INCS) capability.

For each of the Army noise source types, a data base will be compiled, a noise prediction sub-model will be created and computerized, and the results documented. Blast noise will be handled in work unit A896-A-019. The initial helicopter submodel will be computerized. Existing vehicle noise data sources and models will be reviewed and the results incorporated into the INCS program. Also, homogeneous noise areas and rocket noise will be investigated and added to the INCS program. A manual method to combine the contours will be developed and computerized.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Construction Engineering Research Lab.

4.0016, MIDDLE-ATMOSPHERE PROGRAM MANAGEMENT

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

4.0017, TO MODEL THE MAGNETIC FIELD OF JUPITER

D.B. Beard, University of Kansas, Lawrence Campus, Graduate School, *214 Strong Hall, Lawrence, Kansas* 66044 (NAGW 217)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

4.0018, DIAMOND MACHINED LENS

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To demonstrate the fabrication of corrected geodesic lens in Ti-In diffused waveguides using numericaly controlled diamond machining techniques. Accurate control of the focal point, profile and position of these lens will be demonstrated. These lens will be corrected for spherical aberrations using a suitable lens profile. Single and double lens combinations will be fabricated and evaluated. Characterization will include thruput loss, scatter, focal length, diffraction limited performance and acceptance angle. The lenses will be designed for incorporation into microoptical microwave spectrum analyzers jointly under Navy and Air Force development.

Using computer, numerical controlled diamond machining techniques, several microoptical lens will be fabricated. The profile of the lens has been theoretically determined and it allows for corrections for spherical aberrations. Edge rounding is accounted for in the program. Depth control of plus/minus 1 micron and placement of the focal point to better than 10 microns will be demonstrated. Using end-fire coupling techniques, the quality of lens will be examined thru far-field measurements. Finally, a two-lens optical system will be fabricated on a substrate whose edges were precisely polished. Final characterization of the lens will be performed using the Westinghouse photodiode array butt-coupled to the waveguide/lens system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0019, A MULTIPLE SCALES APPROACH TO THE ANALYSIS AND SYNTHESIS OF CONTROL SYSTEMS WITH FAST AND SLOW DYNAMICS

R. Ramnath, Charles Stark Draper Lab. Inc., *68 Albany St., Cambridge, Massachusetts* 02139 (DN975512; N00014-79-C-0462)

When high-performance vehicles are operated at the extremes of their performance capabilities (i.e., VSTOL transition, aircraft maneuvering to high angle-of-attack, attack class submarine making rapid depth change or high-speed turn, etc.), dynamic instabilities and loss of control may occur. Under these conditions, the equations of motion which describe the vehicle dynamics become time-varying (i.e., equation coefficients vary with time). Current analysis and design techniques are based on the simpler time-invarient systems (equation coefficients are constant) and can lead to erroneous predictions of stability for time-varying systems. The objective of this research is to develop analysis and synthesis methods for control of time-varying systems.

The method of approach will consist of the asymptotic theory of generalized multiple scales in conjunction with extended multi-dimensional laplace transforms. The temporal behavior of the system response will be extended, by the general multiple scales theory, into multiple time dimensions after a suitable reparameterization based on the ratio of the time constants of the modes of the system response. For the second research this approach will be extended to an important class of problems in modern control theory hierarchy of accuratre reduced-order

systems; and (c) improvements in computational efficiency for real-time on-line control.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0020, SPACE APPLICATIONS OF AUTOMATIONS, ROBOTICS AND MACHINE INTELLIGENCE SYSTEMS (ARAMIS)
Unknown, Massachusetts Inst. of Technology, Graduate School, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAS 8-34381)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

4.0021, METHODOLOGY FOR DESIGN OF FAULT-TOLERANT CONTROL SYSTEMS
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Reliability has become of major importance for naval systems. This task has as its objective an overall design methodology for failure detection, isolation and accommodation, particularly for control systems.

Included in this task will be the development of analytic tools for the evaluation of system performance, a detailed study of the relative merits of different design strategies and the development of control strategies that can adapt to a number of actuator and sensor failures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0022, AUDIO AVIONICS CONTROL/STATUS SYSTEM
L.A. Sorenson, Semcor Inc., *1500 N. Kings Hwy., Cherry Hill, New Jersey* 08034 (DN081138; N62269-79-C-0009)

Generation of a functional configuration governing the implementation of an audio avionics control and status system. The configuration is to define an overall aircraft avionics system which will enable the implementation of voice recognition and synthesis (VRAS) equipment as part of the overall avionics system configuration. This contracted effort supports work unit ZC101, agency accession DN 081123.

Study and analyze modern day avionics system implementation multiplex data bus control status audio signals and trends, then couple this with present and future VRAS technology projections for generation of a configuration which will allow for the incorporation of such VRAS technology when available.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Communication Navigation Tech Directorate

4.0023, NEAR-FIELD ANTENNA MEASUREMENTS
R. Staples, U.S. Dept. of Defense, Navy, Naval Air Engineering Center, *Lakehurst, New Jersey* 08733 (DN096115)

Develop advanced test algorithms to provide both boresight and radiation pattern testing for installed airborne antennas with fault location capability for distorted patterns.

Develop an antenna test algorithm for use in a general purpose near-field antenna tester. In addition, develop a simulated model antenna fault identification location tester. System feasibility studies will be completed with particular attention to requirements for built-in test.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0024, ATMOSPHERIC MEASUREMENTS DURING A SOLAR ECLIPSE
M.G. Heaps, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0F1771)

The technical objectives are quantitative descriptions of the concentrations and time histories of the ions and electrons in the D-region during the course of a solar eclipse. The changes in ionization levels, dissociation and electron attachment/detachment processes during the passage of the moon's shadow serves as a partial simulation of nuclear weapons effects in the atmosphere. Section 9 of the Army qualitative research requirements for nuclear weapons effects information documents the requirements for the investigation of natural atmospheric events which simulate nuclear weapons effects in connection with Army communications and ballistic missile defense.

The data gathered during a solar-eclipse field-measurements' program is to be reduced and analyzed and will be used as input for computer models of the D-region. Emphasis will be on simulating the electron and ion densities and establishing the dominant electron attachment/detachment processes.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

4.0025, THEORETICAL STUDIES OF WAVE PROPAGATION IN LAMINAR BOUNDARY LAYERS
G. Miller, New York University, School of Engineering, Dept. of Aerospace Science, *University Heights, New York* 10453 (DN675088; N00014-76-C-0183)

The instability of laminar boundary layers and the associated transition to turbulence are extremely complex phenomena that have major effects on the performance of aircraft and missiles throughout the speed range. An increased understanding of these occurrences, coupled with an improved predictive capability, could lead to a significant improvement in vehicle performance, particularly as regards range and fuel economy. The proposed research will study, theoretically, the propagation of waves through laminar boundary layers at high subsonic speeds emphasizing the nonlinear interaction of the wave with the boundary layer.

The stability of the laminar boundary layer will be studied, by finite difference techniques, for the flow past a flat plate at high subsonic speeds. Disturbances will be introduced at the upstream, downstream and outer boundaries. The propagation and distortion of the disturbances, and the associated modifications of the flow, will be calculated using second order compressible boundary layer theory. The influence of disturbance amplitude and wavelength will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0026, NAVIER-STOKES NUMERICAL STUDIES OF THE SUPERSONIC LAMINAR FLOW ABOUT CONES AT ANGLES-OF-ATTACK
S.G. Rubin, Polytechnic Inst. of New York, Long Island Center, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *Farmingdale, New York* 11735 (DN875484; N00014-79-C-0849)

The development of accurate methods to compute the flow fields about bodies for complex flow situations is essential for the aerodynamic design and optimization of aircraft and missiles. In the proposed investigation, the laminar flow over a yawed cone will be studied within the the framework of the Navier-Stokes equations. Particular attention will be devoted to the formation of vortices near the leeward symmetry plane; the formation of cross-flow imbedded shocks; and the strong viscous-inviscid interactions for both the axial and the secondary flows.

A new solution procedure, for the Navier-Stokes equations in primitive variables, which utilizes the fact that the flow has a dominant (axially) direction will be used. The difference equations will employ a filtering technique, which in model problems has drastically reduced oscillations associated with captured shocks. The filtering procedure is equivalent to a weighted-average of conservation and non-conservation differencing.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0027, MRAP/SRAP MAINTENANCE
A.P. Converse, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF935030)

This is an in-house effort to maintain the microcircuit and semiconductor reliability assessment programs (MRAP and SRAP). This maintenance includes updating the data bases to reflect current MIL-M-38510, detail specification and QPL status changes, as well as RADC useage recommendations. The software which supports these data bases will also be updated and additional software will be developed as required. Under this effort, information will be disseminated, new users will be instructed, and any problems with the system which arise will be corrected.

Data received from DESC on microcircuit specification, qualification, and system usage will be included into the reliability assessment programs using software developed by RBRA and resident on the RADC Honeywell 6180 Multics System. As new requirements are developed, they will also be incorporated into the existing software. The up-to-date status of characterization work in progress will also be maintained based on inputs from the responsible RADC engineers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0028, HIGH-SPEED AIRDROP TECHNOLOGY

M. Harm, Stencel Aero Engineering Corp., *Asheville, North Carolina* (DA0H4398)

The ultimate goal of this effort is the development of the technology for conducting airborne assault and resupply mission from aircraft flying at 250-400 knots. The immediate objective is to conceptualize methods for achieving such speeds for delivering supplies and equipment.

The high-speed spectrum will be analyzed to determine technical problem areas. Concepts for the solutions to these problems will be formulated and tested.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0029, INVESTIGATION OF FAULT-HANDLING CAPABILITIES AND LIMITATIONS OF FAULT-TOLERANT COMPUTER ARCHITECTURE

J.W. Gault, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Electrical Engineering, *Raleigh, North Carolina* 27607 (NAG 1-194)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0030, STRUCTURAL AND ELECTRICAL PROPERTIES OF ION-IMPLANTED GALLIUM ARSENIDE

M.A. Littlejohn, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Electrical Engineering, *Raleigh, North Carolina* 27607 (DN475218; N00014-75-C-0827)

Advanced Navy electronic systems will use components fabricated from materials using new techniques. Compound semiconductors offer increased capbaility in electron devices and the technology and physics must be understood and developed for fabricating devices in these materials using ion implantation.

Transmission electron microscopy (TEM) is used to investigate the character and distribution of defects in gallium arsenide (GaAs) and other semiconductors produced by ion implantation. Various types of defects ranging in size from 30 to 500 Angstroms are detected and analyzed as a function of depth from the surface. These data are then correlated with analogous depth distribution functions of impurity atom concentration measured by mass spectroscopy at NRL, of photoluminescence measurements and of electrical conductivity by Hall effect measurements. Impurity ions will be implanted into GaAs and InP substrates held at different temperatures, from room temperature up to 350 C. Various annealing conditions and methods will be used to determine optimization procedures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0031, COMMUNICATIONS - CONDUCTIVITY AND OPTICAL EFFECTS IN ANISOTROPIC SEMICONDUCTORS

J.F. Schetzina, University of North Carolina, North Carolina State University, School of Liberal Arts, Dept. of Physics, *Raleigh, North Carolina* 27607 (DN223319; N00014-77-C-0470)

This work on the electrical transport and photovoltaic effect in semiconductors is applicable to the development and improvement of electronic devices, optical switching and electrical instrumentation used by the Navy in its communications operations.

Experimental observations of the photomagnetoelectric and anomalous photovoltaic effects in cadmium telleride films will be compared with theoretical predictions of a new model. This model is based on properties of a variably (with depth) anisotropic relaxation semiconductor. Optical absorption, X-ray diffraction, and X-ray fluorescence spectra will be obtained for well characterized films.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0032, LONG WAVELENGTH JEM

P. Pathak, Ohio State University, Columbus Campus, School of Engineering, Dept. of Electrical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF906190; F19628-80-C-0056)

AF function - target signatures for IFF purposes. Deficiency - the problem of noncooperative target recognition (NCTR) techniques is of first priority to the Air Force. The techniques are so inadequate that engagement is still predicated on visual identification. Objective - to determine analytically the radar cross section at long wavelengths of a model of the jet intake region. These wavelengths are in the resonance region. The analytic results are to be compared with experimental measurements. How research contributes - at present the phenomenon of jet engine modulation (JEM) is being applied only be airborne systems using short wavelengths. The results of this research are to be applied to ground based systems for IFF purposes. By using ground-based systems long-range identification can be achieved.

Model the jet intake as a semi-infinite, hollow, metal pipe (circular cylinder) with a simplified geometrical configuration to simulate the first compressor ring. Calculate the backscattered field by using the generalized scattering matrix technique. Compare with data from cavity models taken at frequencies from 1.0 to 12.0 GHz.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0033, PLASMA PROPERTIES OF GAS LASERS

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AF function - electrical discharges applied to gas laser and high power technology. Deficiency - present electrical discharge lasers are limited in performance and lifetime by discharge instabilities, contamination and electrode or boundary effects. Research - the in-house experimental program uses sample discharges such as DC, RF or microwave, UV or electron-beam preionized plasmas as representative of those used in lasers or high-power switches of current AF interest. The application of a wide variety of excitation methods and diagnostics will permit a detailed and accurate determination of the characteristics, limitations of and possible improvements to these discharges. How research contributes - this research supports several Air Force requirements in the area of medium- and high-power lasers in the infrared and visible wavelength range as well as switch technology. Research also supports data requirements of theoretical studies under WU 12.

The research program uses small in-house experiments to generate and analyze accurately defined CW or pulsed discharges. Excitation methods include standard very high stability DC discharges, pulsed and DC RF and microwave discharges as well as pulsed and DC UV or electron-beam preionized discharges. The diagnostics are compatible with the well defined discharges and include time resolved spectroscopy from the vacuum UV to medium infrared and electrical diagnostics. Pres-

ently, emphasis is on the analysis of population distributions in molecular gases under various excitation conditions, analysis of preionization mechanisms and seed characterization of UV-preionized discharges and instability mechanisms in conventional and E-beam discharges. Future plans call for research on electronegative discharges relevant to lasers and switches.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0034, THERMAL ENERGY STORAGE/HEAT TRANSFER RESEARCH

T. Mahefkey, U.S. Dept. of Defense, Air Force, Aero Propulsion Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF463170)

Conduct basic research on thermal energy storage and heat transfer as applied to Air Force spacecraft and aircraft power and thermal control subsystems. Initial phases of the research will center on thermophysical characterization and corrosion studies of integral heat pipe/thermal storage units, and analysis of their dynamic charge/discharge behavior.

Apparatus to process and deprocess file test liquid metal heat pipes will be purchased and assembled. Corrosion studies on S.S. and inconel 617 clad Na heat pipes will be conducted. Heat transfer modeling of O2 sorption systems will be initiated with appropriate subscale experimental investigations conducted concurrently.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

4.0035, REAL-TIME ELECTRO-OPTICAL SENSOR PERFORMANCE PREDICTION

H.E. Geltmacher, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF101480)

To further develop and refine E-O sensor performance models developed under 69DF ADP specifically: (1) refine models to accurately predict lab measured parameters such as video SNR vs. target status, (2) refine lab measurement techniques and instrumentation to accurately measure sensor model input/output parameters, (3) refine and develop models to accurately predict observed human plus sensor performance in lab vs. target status, (4) include most valid and accurate atmospheric models available to compute and predict effects of angular dependent scattering, absorption, turbulence, and discreet conditions such as atmospheric layers, (5) demonstrate ability to predict observed performance in real world (tower tests), (6) demonstrate ability to predict observed performance in real tactical situations w/typical tactical targets under a wide variety of weather and climatic conditions (flight tests).

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0036, OPERATION OF PARACHUTE DATA BANK FOR WEAPONS SYSTEM DESIGN APPLICATION

J.H. Deweese, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF132370)

A significant amount of parachute design and performance data associated with military systems applications has been and is continuing to be generated which does not become available to the technical community due to inadequate data reporting and a lack of any rapid access system for parachute performance data. A parachute data bank has been established to circumvent these problems. The objective of this program is to maintain the currency of the bank of parachute design and performance data and expand the data base through the extraction, analysis and storage of pertinent data and information on gliding and supersonic parachute systems. This expansion of the data base will significantly improve and broaden the services the data bank can render for the expeditious design and performance prediction of parachute systems for emergency crew escape, tactical air drop, weapon deceleration and aerospace vehicle recovery applications.

Feasibility studies will be conducted by the contractor to select the best proposed design concepts for further refinement. One or two best designs will be fabricated as laboratory breadboards and subjected to laboratory test and evaluation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

4.0037, VALIDATION SYSTEMS

D.P. Siewiorek, Carnegie Mellon University, Carnegie Inst. of Technology, Dept. of Electrical Engineering, *Frew Ave. & Margaret Morrison, Pittsburgh, Pennsylvania* 15213 (NAG 1-190)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0038, STUDIES OF SHEAR FLOW INSTABILITIES

J.T. Liu, Brown University, Graduate School, Dept. of Engineering, *University Hall, Box 1883, Providence, Rhode Island* 02912 (ENG78-22127)

The objective is to perform basic analytical studies on the instabilities and the large-scale structures that occur in shear flows. The large-scale structure, superimposed upon much smaller-scale oscillations, represents a phenomenon which has been recognized to be of great importance in many engineering problems. It has also been observed in the 'natural' laboratory in the atmosphere and in the ocean during mixing events. Such large-scale motions are now recognized as the dominant noise source in aerodynamic sound generation from a free turbulent jet and present problems in the final stage of efficient chemical reactions in combustors where mixing plays the important role.

This is a renewal of work previously supported under NSF grant ENG 76-24585.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0039, DISTRIBUTED STORE AIRLOADS

W.B. Baker, U.S. Dept. of Defense, Air Force, Arnold Engineering Development Center, *Arnold Air Force Station, Tullahoma, Tennessee* 37389 (DF629000)

Air Force function - aircraft-stores compatibility. Opportunity -structurally efficient store design and certification of stores on aircraft. Goal - development of analytical and wind tunnel techniques to obtain distributed store airloads. How work contributes - provides more accurate airloads data to improve structural design of stores and reduce flight envelope restrictions.

The approach will be to conduct pressure model and segmented store model wind tunnel tests to determine the best wind tunnel technique to obtain distributed airloads. Resulting accumulated data will be compared to the analytical results. The analytical technique will be based on the computer-aided missile synthesis (CAMS) computer program. This program will be modified to calculate the airloads distributed over the store while in an interference flow field. Existing and future flow field data will be used as inputs into this modified computer program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Armament Lab.

4.0040, GRADUATE STUDENT RESEARCHERS PROGRAM

B.N. Antar, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Engineering Science & Mechanics, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NGT 43-001-802)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0041, AN INNOVATIVE INFRARED DETECTOR

M.A. Gundersen, Texas Tech University, School of Engineering, Dept. of Electrical Engineering, *P.O. Box 4340, Lubbock, Texas* 79409 (ENG78-11731)

The primary objective of this research program is the development of a novel infrared upconversion device for detection. Important device features include good detectivity, high speed, good linearity, efficiency, wide range of sensitivity, high-damage threshold, and low noise. The operation of the device is

based upon the principle of an infrared quantum counter. The following investigations are being conducted: (1) Pump wavelength dependence using an infrared source; (2) Signal wavelength dependence of the device; (3) Various device configurations; (4) Ultimate sensitivity of an infrared quantum counter; (5) Limits to internal conversion efficiency; (6) Devices for detection in the far infrared; (7) Further possible materials candidates.

The advance of detection capability in the near- and far-infrared provides for a new class of receivers in a relatively unused frequency band that can be used in communications, radio astronomy, and spectroscopy.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering

4.0042, ELECTROMAGNETIC PROPAGATION IN ACTIVE MULTILAYER WAVEGUIDES

A.B. Buckman, University of Texas, Austin Campus, School of Engineering, Dept. of Electrical Engineering, *200 W. 21st, Austin, Texas* 78712 (DN575155; N00014-75-C-0753)

Research on the propagation of electromagnetic waves in multiple layer waveguide may lead to higher bandwidth or more efficient modulators, improve beam deflectors, and phase shifters in the millimeter and sub-millimeter wave region, or second harmonic generation devices with potential uses in naval radar and communications systems.

Analysis is performed on propagation in multilayer waveguide configured so that the effective index of refraction seen by the guided mode to small changes in bulk index is large. Experimental research is carried out to confirm the analytical results.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0043, SEPARATION OF SUPERSONIC TURBULENT BOUNDARY LAYERS

J.P. Lamb, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: A prediction technique for the free interaction process between viscous and inviscid flows has been developed. This integral method permits rapid estimates of potential separation locations and also allows generalized correlations of pertinent parameters. The formulation also illustrates the governing influence of initial conditions of the free interaction process. Predictions have been found to be in generally good agreement with the body of experimental data. This is a continuing experiment.

SUPPORTED BY University of Texas

4.0044, DEVELOPMENT WORK ON METEOROLOGICAL DATA PROCESSING FIRMWARE

F.L. Staffanson, Utah Higher Education System, University of Utah, School of Engineering, Dept. of Electrical Engineering, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (NAG 6-15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

4.0045, THE ANALYSIS AND SYNTHESIS OF A SPECTRAL DATA TRANSFER SYSTEM THROUGH A SATELLITE CHANNEL

J.S. Lee, J.S. Lee Associates Inc., *2001 Jefferson Davis Hwy., Arlington, Virginia* 22202 (DN075239; N00014-80-C-0129)

To improve the Navy's surveillance capabilities by improving signal processing technology for satellite communication networks.

The contractor will develop a system concept for surveillance using spectral line detection via buoy fields and transmit this information via satellite to a central processing center.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0046, COHERENCE IN OPTICAL PATTERN RECOGNITION (DA0N8112)

R.D. Leighty, U.S. Dept. of Defense, Army, Corps of Engineers, Engineer Topographic Lab., *Fort Belvoir, Virginia* 22060 (DA0G5141)

A method of correlating images with a library of known patterns for feature extraction will be studied based on incoherent correlation techniques. This method promises to have lower noise than similar coherent correlation techniques thus giving a cleaner correlation signal. Pattern recognition is useful for intelligence and photogrammetry and can be an aid in automation of cartographic feature extraction.

An incoherent correlator will be built and a variety of simple and complex inputs will be processed. These inputs will be derived from laboratory models and aerial photography. Output correlations will be sampled and processed to remove bias and perhaps to decrease noise by smoothing. The correlator has been designed and bench space is available for these experiments.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Engineer Topographic Lab.

4.0047, INTELLIGENT POSITIONING SYSTEM

D.L. Love, U.S. Dept. of Defense, Navy, Naval Surface Weapons Center, *Dahlgren, Virginia* 22448 (DN085192)

To establish the means for positioning a robotic arm relative to an electronic circuit board using artificial intelligence and existing technology so that the arm can eventually be made to repair circuit boards.

The position of the circuit board to be repaired is to be determined using optical sensors and a micro-computer. Two focal plane arrays will be used to gather stereoscopic information in the visible portion of the optical spectrum. By comparing the sensed image with the stored image, it should be possible to generate a jump command which can be used to move the circuit board or redefine a coordinate system so that the position in the plane is precisely known. The position of the board along the line of sight (z axis), is to be determined initially from commands needed to superimpose the image of a second focal-plane array upon the first. The distance of the board from the sensors could then be computed from the shift required.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Surface Weapons Center

4.0048, AUTOMATED AIDS TO ISD

P. Smith, Veda Inc., *1755 Jefferson Davis Hwy., Arlington, Virginia* 22202 (DN994031; N61339-79-C-0076)

Procure a contract to continue development of a system for aiding ISD activities for the application of ISD to naval aircrew training. The continuation of effort also will acquire: (a) a manual and instructional course on the use and completion of development of the system, (b) a specification and assessment of the source of anticipated benefits of the system, and (c) a final report on the activities and results of the effort.

Instructional personnel will develop and instruct NAVTRAEQUIPCEN personnel in the development of data bases and application programs in a computer software format such that ISD data from previous ISD efforts can be accessed and applied to current ISD needs. These programs will be tested at NAVTRAEQUIPCEN.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

4.0049, COMPRESSOR BLADE RESPONSE TO IMPROVE INLET DISTORTION INDICES

W.F. O'Brien, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Mechanical Engineering, *Blacksburg, Virginia* 24061 (DN975647; N00014-79-C-0748)

The objective of this research effort is to develop a better understanding of the important variables in the unsteady response of compressor rotor blades to circumferential distorted inflow. This information will be of value in discovering the nature of compressor rotor blade flow response to rapid changes in incidence angle and could be instrumental in obtaining in-

creased life and reliability of military engines with optimum performance.

Measurements will be made of the dynamic pressures on rotor blades employing on-rotor instrumentation, including single and multi-channel telemetry devices for high-frequency measurements. Improved distortion models will be formulated and verification made on both low- and high-speed test compressors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0050, PROTECTION OF ADVANCED ELECTRICAL POWER SYSTEMS FROM ATMOSPHERIC ELECTROMAGNETIC HAZARDS

R.L. Solem, Boeing Co., *7555 E. Marginal Way S., P.O. Box 3999, Seattle, Washington* 98124 (DF463260; F33615-79-C-2006)

Determine the vulnerability of advanced aircraft electrical power systems to lightning induced transients and develop cost effective protection techniques to minimize electrical power system failures and reduce transients injected into aircraft equipment by the electrical power and distribution wiring.

State-of-the-art analytical techniques will be used to determine electrical power generation and distribution system and system component vulnerabilities. Trade studies will be conducted between viable protection techniques to determine cost and performance impact of alternative protection schemes. Design guidelines will be developed for electrical power system protection for advanced aircraft.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, MATERIALS PROCESSING IN LOW-GRAVITY PROGRAM

Unknown, University of Alabama in Huntsville, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-34530)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0002, RESEARCH RELATED TO THE RELATIVITY EXPLORER

G.R. Karr, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Mechanical Engineering, *Huntsville, Alabama* 35807 (NAS 8-33809)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0003, GALILEO NIMS

L.A. Soderblom, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeological Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (0-9580-02238)

The principal goal of the project is to provide scientific guidance for the development of hardware, mission sequence design, data processing, and geological analysis of data returned by the NIMS aboard the Galileo mission to Jupiter. Prime objective is to produce compositional and mineralogical maps of the surfaces of the large Galilean satellites of Jupiter. Due to a slip in the availability of NASA's Space Shuttle, the launch of the Galileo spacecraft will be delayed by two years. This will require a redesign of the mission profiles and sequence designs during the next fiscal year.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, GEOLOGY OF THE APOLLO-15 LANDING SITE

G.A. Swann, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (0-9580-02552)

The single objective is to prepare a draft for a professional paper that summarizes the state of knowledge of the geology of the Apennine-Hadley region after the Apollo-15 mission there. No 'new' research is planned; the project will be completed by assembling various earlier data, some of which were preliminary reports of the field geology experiment team and incorporating some additional data that were never published by the team, and from elsewhere in the literature, into a draft suitable for publication as a professional paper.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0005, FRAUNHOFER LUMINESCENCE

R.D. Watson, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (7030-24110)

STATES TO WHICH PROJECT PERTAINS: California, Wyoming, Idaho.

Several test sites including the Copper Mountain Geosat uranium site and the Santa Margarita phosphate outcrops at Pine Mountain, California, will be flown with the airborne FLD imaging system. Computer-enhanced images will be produced to further define the capability of luminescence remote sensing for mineral detection.

Comparative experiments between the U.S. Geological Survey and other Government agencies, including the Bureau of Land Management and Bureau of Reclamation, are planned to assess the value of luminescence remote sensing in natural resource evaluation. The California Desert research site was selected by BLM as a test area for overflights with the FLD. Images of this area will be evaluated to determine their capability for defining potential mineralization. Cascade and Lowell Reservoirs have been selected by Bureau of Reclamation as test sites for determining water quality from FLD imagery.

An experiment is planned to measure phytoplankton concentration in the open ocean (near Santa Barbara, California) using the airborne Fraunhofer line discriminator. Results will be compared with concentrations determined from shipborne surface measurements.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0006, METEORITIC BASALTS

M.J. Drake, University of Arizona, School of Liberal Arts, Dept. of Planetary Sciences, *Tucson, Arizona* 85721 (NAGW 220)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0007, ISENTROPIC COMPRESSION AND DECOMPRESSION OF OUTER SOLAR SYSTEM MOLECULAR MATERIALS

T.J. Ahrens, California Inst. of Technology, Graduate School, Dept. of Geological & Planetary Sciences, *1201 E. California Blvd., Pasadena, California* 91109 (NAGW 205)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0008, STUDIES OF THE COMPOSITION AT SOLAR ENERGETIC PARTICLES

E.C. Stone, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NAGW 200)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0009, NAVY ENVIRONMENT MARINE ATMOSPHERIC AEROSOL

M. Griggs, Science Applications Inc., *1200 Prospect St., P.O. Box 2351, La Jolla, California* 92037 (DN775510; N00014-77-C-0489)

The atmospheric marine boundary layer is of considerable importance to Navy operations particularly in the area of electro-optical systems which are affected by the nature and distribution of aerosols over the oceans. This research has as its goal the capability to produce daily, global maps of aerosol isopleths over the ocean areas by relating satellite visible radiance data to the atmospheric aerosol optical thickness.

The contractor is analyzing sun photometer data and satellite visible radiance data and relating this data to auxiliary data such as white cap coverage and relative humidity. Data input will include that obtained by Navy Research Laboratory at NASA Wallops Center in June 1979 and that obtained during the MARSEN I field experiment. He is also performing theoretical calculations to investigate the effect of the aerosol vertical distribution on the upwelling radiance for non-vertical viewing angles.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0010, RESEARCH RELATIVE TO RUPTURE MECHANICS OF PLATE BOUNDARIES

A.M. Nur, Stanford University, School of Earth Sciences, Dept. of Geology, *Stanford, California* 94305 (NAG 5-178)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0011, EVOLUTION OF THE THARSIS REGION OF MARS

M.H. Carr, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *345 Middlefield Rd., Menlo Park, California* 94025 (9-9580-02375)

The major goals are to determine the deformational and volcanic history of the Tharsis bulge of Mars, using high resolution Viking images to establish intersection and transection relationships between tectonic and volcanic systems and topographic data to establish regional warping through time.

Plans involve continuation of the following tasks: 1) Determination of the direction of volcanic flows with respect to current topographic gradients to establish the regional warping history; 2) Determination of the locations, orientation, and age of graben and mare ridges; 3) Determine the relative sequences of volcanic flow and fracturing by examining transection and intersection relationships for the region.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0012, EVALUATION AND ASSESSMENT OF METHODOLOGY FOR ESTIMATING USER REQUIREMENTS AS A COMPONENT OF THE ENERGY NEEDS DESIGN STUDY

R.N. Colwell, University of California, Berkeley Campus, School of Natural Resources, Dept. of Forestry & Conservation, *Berkeley, California* 94720 (NCA 2-50103)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0013, STRATOSPHERIC CALIBRATION OF THE QUARTZ CRYSTAL MICROBALANCE (QCM)

S.K. Freidlander, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Chemical Nuclear & Thermal Engineering, *405 Hilgard Ave., Los Angeles, California* 90024 (NAS 1-16674)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0014, CONDENSATION PROCESS IN THE EARLY SOLAR SYSTEM

J.R. Arnold, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California* 92037 (NAGW 210)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0015, GLOBAL MAGNETISM - GM

J.C. Cain, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9780-01754)

Completion of definitive computation of the geomagnetic field 1957-1980. Evaluate surface and satellite (including MAGSAT) data to obtain global crustal anomaly model.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0016, STUDIES IN REMOTE SENSING APPLIED TO GEOCHEMICAL EXPLORATION

F.C. Canney, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Exploration Research, *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9330-00815)

STATES TO WHICH PROJECT PERTAINS: Maine, Montana and Colorado.

The overall objective of this project is to develop remote-sensing techniques for identifying mineralized areas in regions of heavy vegetation. Vegetation can be used as a link between abnormal chemical conditions in the soil and an aircraft- or spacecraft-mounted sensor for the following reasons: (a) plants generally reflect their geological environment by their distribution patterns and minor-element content; and (b) laboratory and field studies have established that metal stressed and normal vegetation can have subtly different spectral characteristics. Therefore, a geochemical anomaly in a heavily forested area might be detected by spatial and/or spectral changes in the reflection of the vegetation canopy.

To date aerial surveys using color infrared film, multiband photography, and multispectral line scanners, coupled with the simpler interpretative techniques have not been successful in discriminating eeochemical anomalies in heavily forested areas. Apparently the reflectance anomaly was totally obscured by variables unrelated to soil geochemistry. However, recent research in cooperation with W. Collins of NASA's Goddard Institute for Space Studies, and using a specially built high-resolution airborne spectrometer, suggests that high-resolution spectral data, where processed by computerized waveform analysis techniques, can be used to separate vegetation growing over a mineralized zone from background vegetation.

In the current year, additional testing of the instrument and analysis techniques will be done at several mineralized sites of different types.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0017, ISOTOPES OF THE UPPER MANTLE

M. Tatsumoto, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Isotope Geology, *Box 25046, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9740-00384)

STATE TO WHICH THE PROJECT PERTAINS: Hawaii.

The Nd and Pb isotopic study of Hawaiian rocks will be continued with regard to the earth mantle evolution. The Nd and Pb isotope study in volcanics from Hawaiian Ridge and Emperor Seamounts will also be performed.

The study of the U, Th, and Pb distributions in basaltic rocks will be continued.

Pb, Nd, and Sr isotope study will be initiated for volcanic rocks of Santorin Island for the study of calcalkaline genesis.

We plan to determine tellurium isotopic abundances in meteorites to see if these can be correlated with xenon isotopic compositions with regard to nucleosynthesis.

We plan to continue to study U-Th-Pb and Sm-Nd systematics and U isotopic compositions of lunar and meteorite sam-

ples to compare their origin and history to the Earth's evolution.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0018, GRADUATE STUDENT RESEARCHERS PROGRAM
J. Wu, University of Delaware, School of Engineering, Dept. of Civil Engineering, *Newark, Delaware* 19711 (NGT 08-001-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0019, SOLAR-TERRESTRIAL PHYSICS
D.J. Michels, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880036)

To improve basic understanding of the relationships between geophysical disturbances and the variability of solar plasma and electromagnetic radiations. Improved understanding of the mechanisms that cause disturbances in the Earth's magnetic field and the ability to characterize and predict the occurrence and severity of such disturbances (geomagnetic storms) is of great importance to the Navy. Essential Navy/DOD systems are affected by geomagnetic anomalies in some cases geomagnetic activity ranks high among causes of system outage or degradation or as a significant cause of false signatures.

Research emphasis will be on improved understanding of how the solar material is propagated towards Earth and on understanding what parameters govern the severity of the geomagnetic response. Solar monitoring experiments will be flown in satellites collaborative arrangements will be worked out to achieve the multidisciplinary approach required by this problem.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

5.0020, ENVIRONMENTAL REMOTE SENSING
V.E. Noble, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN220082)

To determine experimentally the necessary remote sensors and techniques which are applicable for improving oceanographic monitoring and prediction. Coordinate remote sensing studies with the objective of satisfying Navy Environmental Remote Sensing Program (NERSP) needs. Efforts are directed toward the Navy operational requirement (OR) for satellite measurement of oceanographic parameters (SMOP).

Utilize electromagnetic sensors, both passive and active, to determine quantitatively the accuracies with which sea surface temperature, surface winds, wave heights, topography and other sea surface parameters can be measured to insure that the measurements and techniques are fulfilling NERSP's needs.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0021, INITIAL INVESTIGATIONS OF SEA WATER FLUORESCENCE ABSORPTION PROPERTIES AND THEIR RELEVANCE TO OCEANIC LIDAR INTERPRETATION
R.G. Zika, University of Miami, D.H. & Lewis Rosenstiel School of Marine & Atmospheric Sci., Dept. of Marine & Atmospheric Chemistry, *4600 Rickenbacker Cswy., Coral Gables, Florida* 33149 (NAG 6-13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

5.0022, AGRICULTURAL WATER DEMAND PREDICTION USING REMOTE-SENSING TECHNOLOGY FOR GEORGIA WATER RESOURCE MANAGEMENT
J.R. Jensen, University of Georgia, Franklin College of Arts & Sciences, Dept. of Geography, *Athens, Georgia* 30601 (A-083-GA)

The proposed research involves the prediction of agricultural water demand using remote-sensing technology for Georgia environments. An accurate, cost-effective procedure for predicting agricultural water demand is needed in order for state officials to manage sensitive aquifers being seriously impacted by increasing amounts of irrigated agriculture. The research plan involves: a. identification of critical water demand variables and their coefficients using multiple regression techniques applied to data from control study areas where land cover, soils, climatic and metered water use data is available, b. digital image processing applied to multi-date imagery of the control environments to document LANDSAT's ability or inability to provide data on significant variables, c. comparison of remote sensing-aided and conventionally derived agricultural water demand estimates to determine accuracy, and cost-effectiveness, and d. identification of optimum agricultural water-demand estimation procedures incorporating the best of both conventional and remote sensing-aided methodologies.

If successful, the procedure will be transferred to the Environmental Protection Division of the Georgia Department of Natural Resources.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0023, STUDY OF GEOSTROPHIC MESOSCALE EDDIES IN THE NORTH ATLANTIC
A.R. Robinson, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Oceanography, *Cambridge Station, Cambridge, Massachusetts* 02138 (NAS 6-3182)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Wallops Flight Center

5.0024, EXPLOSIVE OCEANIC CYCLOGENESIS
F. Sanders, Massachusetts Inst. of Technology, School of Science, Dept. of Meteorology, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN975335; N00014-79-C-0384)

The objective of this research is to explore in detail the climatology and physics of the extremely rapid deepening of extratropical cyclones that occur over middle latitude oceans during the cold season. There are deficiencies in the numerical models that are preventing reliable forecasts of these storms and their effects on naval operations. This research is aimed at correcting those deficiencies.

Studies of the historical climatology of the storms will establish their general characteristics. These studies will be supplemented with a more detailed study during the next three years that will be based on improved data from satellite and a more recent upper air sounding and reporting network. Computer models will be developed to fit the improved definition of the storms and it is expected their improved prediction.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0025, ELECTROMAGNETIC PERTURBATIONS AND SCATTERING OF JUPITER RING DUST
I.I. Shapiro, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAGW 215)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0026, FAR-IR TRANSMISSION
E.V. Loewenstein, U.S. Dept. of Defense, Air Force, Cambridge Research Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF256080)

AF function - surveillance, homing, advanced sensors, meteorology. Deficiency - IR absorption and emission by the atmosphere interferes with the operation of sensors, surveillance, and early warning systems. Research - direct measurement of far-IR transmission and emission of the upper atmosphere from KC-135. How research contributes - permits establishment of design criteria for IR sensors used in surveillance and early warning systems operating against atmospheric backgrounds. Far-infrared transmission of the atmosphere is to be measured from a KC-135 aircraft flying at 40,000 feet, with the sun at 90 degrees to the direction of flight. A window will be removed

from the aircraft and far-IR radiation from the sun will be brought through the opening to a spectrometer. The spectrometer will be scanned at a rate of about six scans per minute so that data from a localized area of the sky can be analyzed. The equipment is nearly all on hand and will be installed in the aircraft. The data will be used directly as well as through computer models to determine how a given sensor will function against a real atmospheric background.

SUPPORTED BY U.S. Dept. of Defense, Geophysics Lab., Optical Physics Div.

5.0027, AURORAL IONOSPHERE STRUCTURE

J. Buchau, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF584660)

AF function - communication and detection. Deficiency - prediction and real time specification of ionosphere and aurora. Objective - to improve the understanding of the structure and dynamics of the high latitude ionosphere using a large data base collected in a 250-flight program supporting OTH testing. To feed new insight of the structure of the high latitude ionosphere into existing models with the goal to achieve more realistic propagation prediction capabilities at mid-to-high latitudes. How research contributes - the correlation of capsule time histories of ionospheric/auroral conditions with existing models (F-layer trough model, auroral E-layer model, auroral es and visible auroral models, F and E auroral clutter models, auroral clutter models, auroral absorption model) will permit validation of the models or identify areas for improvement. This in turn will result in an improved capabiliy to be sued for prediction and evaluation of HF communication and OTH detection systems operating at mid- and high geomagnetic latitudes. Additional impact from this effort is expected in such areas as HF direction finding, total electron content (TEC) and VHF/UHF scintillations.

Geophysical data collected over the one year test period of the OTH experimental radar with a total of six airborne expeditions at auroral and sub-auroral latitudes will be analyzed. The data will cover a full year around the maximum of the current solar cycle in thirty 8-hour measuring periods. The analysis will provide a detailed description of the observed ionospheric and auroral structure with high temporal and spatial resolution. A comparison will be made between the data and the existing models of various ionospheric/auroral features of the high latitude propagation environment. Parameters to be extracted from the data base for comparison with model values are - equatorward/poleward F-layer trough boundaries, north/south fof2 trough cross-section, auroral E-layer in latitude/critical frequency/minimum height profiles, quantitative auroral absorption values from ground sites and qualitative airborne absorption profiles, auroral E/F irregularity region boundaries. The models of the various ionospheric features will be assessed as to their validity for HF propagation predictions and improved where possible for integration into the existing ionospheric prediction programs such as its 78.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0028, SPACE VEHICLE CHARGE EJECTION STUDIES

H.A. Cohen, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583620)

AF function - communications, satellite survivability and surveillance. Deficiency - inadequate knowledge of the effects of charged particle ejection systems on space vehicles in the upper atmosphere. Objective - to study and determine Air Force applications of rocket- and satellite-borne charged particle ejection systems. How research contributes - the research will determine both the advantages and disadvantages of Air Force applications of charged particle ejection systems on space vehicles.

A sounding rocket payload will be designed, built, tested, and flown to achieve the objectives of measuring spacecraft charging during beam ejection, determining limitations of using unneutralized beams, and investigating techniques and problems of high-energy charge particle ejection and beam-ambient plasma interactions. Charge particle ejection sources will be used to eject charged particles both positive and negative with a wide dynamic range of current, mass, energy and injection period. For the purpose of investigating spacecraft charging during the rocket payload flight, measurements will be made of beam characteristics, vehicle charging, the shape and structure of sheaths, and changes in return current characteristics. Measurements will also be made of the important ambient and vehicle parameters such as ion and electron density and temperature before and during charge ejection, the neutral density and characteristics of the ambient near the vehicle, and vehicle pitch and aspect angles. The data will also be compared to theory for validation and extension of models used to explain and predict beam ejection effects on space vehicles and the atmosphere.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0029, SHAPE AND STRESS ANALYSIS OF NATURAL SHAPE BALLOONS

J.F. Dwyer, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF582770)

AF function - advanced balloon system (surveillance, delivery, operations, environmental research support and space equipment test). Deficiency - procedures, adequate for the design of natural shape balloons and the analysis of critical off-design load/altitude conditions, do not exist. Objective - a general computer code for the generation of natural shape balloon designs and the analysis of such balloons under representative flight conditions will be written and demonstrated for selected practical problems. How research contributes -this computer code will enable rapid evaluation of balloon requirements for proposed efforts including the advantages and disadvantages of system options. Further it will provide a means to evalutate proposed balloon design criteria changes.

A computer code written for the design of natural shape balloons, and using the Runge-Kutta numerical technique, will be modified to provide natural shape balloon designs based upon payload altitude and duration requirements. Rigging weight, recovery parachute weight, and ballast weight modelling codes will be included. The partially inflated ascent deployment configuration of natural shape balloon envelopes will be modelled using the Runge-Kutta or a finite difference method and the entire program tested on existing design shapes and a representative number of selected cases related to known operational problems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0030, AIRCRAFT ICING PROBABILITIES

D.D. Grantham, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF583010)

AF function - design and operation of aircraft. Deficiency - more accurate icing information is required because new airframes such as the A10, HH-53, cruise missiles, RPV's and PGM's operate without anti-icing/deicing capabilities. Objective - to collect objectively measured ice accretion observations and to relate them to observations taken by standard radiosondes, and also to relate them to concurrent observations of liquid water content, drop size distributions and associated temperatures. How development contributes - icing probabilities will be used for determining the need of anti-icing/deicing capabilities, in mission planning, in the setting of design criteria, and the development of operational procedures for flight safety. Observations of icing conditions are needed to obtain verification statistics on current forecasting methods, and to develop and test new methods.

The AFGL/LY MC-130E research aircraft will be instrumented with a Rosemont model 871 FA ice detector. When the aircraft is available at Wright-Patterson AFB and icing conditions are forecast above a radiosonde station, within about 300 miles of Wright-Patterson AFB, the aircraft will be dispatched to take observations approximately concurrent with and along the flight of the radiosonde. A number of such flights will be made. The MC-130E will also take icing observations on its flights which are not directly related to this effort, the C-5A, F-

15, F-14, F-111, etc. of the Air Force and the L-1011 of Eastern, Delta and TWA, also have Rosemont ice detectors. Efforts will be made to obtain observations from flights with some of these aircraft also.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0031, 40 MHz DATA REPEATER DEVELOPMENT
H. Laping, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF584420)

Function - advance balloon systems for surveillance, reccnnaissance, communication telemetry and environmental research. Deficiency - the 40 MHz telemetry signals are limited to line of sight from Holloman AFB which is located in a valley between two mountain ranges. Objective - in order to increase the line of sight of a 40 MHz balloon telemetry system a repeater will be designed and tested. The repeater will be co-located with an existing 150 MHz communications repeater on top of a mountain peak near Holloman AFB. The repeater will be a dual redundant system which is remotely controlled by the ground control station located at Holloman AFB. How research contributes - with this repeater in operation, the line of sight distance can almost be doubled, saving money and manpower by not deploying telemetry vans for certain missions not requiring high data rate S-band telemetry.

Two 40 MHz FM receivers and two low-power transmitters with appropriate antennas will be purchased. Two independent redundant repeaters will be designed with the receivers and transmitters. Interface circuits such as narrow band audio filters, automatic modulation control, remote control and failsafe power control will be designed in-house. Integration of in-house designs with the receivers and transmitters will be accomplished with the aid of a contractor. An in-house maintenance instruction manual will be prepared after installation and test of the repeaters.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0032, SATELLITE DENSITY MEASUREMENTS USING IONIZATION GAUGE INSTRUMENTATION
J.P. McIsaac, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581200)

AF function - low altitude, operational satellites, airborne surveillance, ballistic nuclear weapon delivery. Deficiency -inaccuracies in the determination of low altitude satellite ephemerides due to inadequate data on density variation at critical altitudes. Objective - acquisition of atmospheric density measurements on a global scale, to define, correlate and/or relate results empirically with solar and geophysical phenomena. How research contributes - permits direct accurate measurements of density providing inputs to be used in the development and upgrading of forecasting techniques.

Ionization gauge instrumentation will be flown onboard the S77-2 spacecraft providing measurements of atmospheric neutral density during a year in which solar activity is on the increase approaching its maximum peak period. Instrumentation using ionization gauges also includes a motor-activated air-stream modulator. These S77-2 flight units are capable of direct measurement of atmospheric gas density but will also be flight tested for potential applications as atmospheric gas temperature monitors. Data acquired in this flight will be utilized and merged with the S3 satellite density data base for use in empirical studies as well as analysis and correlation investigations of a statistical nature.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0033, TOPSIDE IONOSPHERE MEASUREMENTS OF LOW-ENERGY IONS AND ELECTRONS
M. Smiddy, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580770)

AF function - surveillance, communications, navigation and ionospheric modelling. Objective - develop instrument for monitoring ion and electron densities, temperature and scale height in the topside ionosphere to be used as inputs for ionospheric models. How research contributes - permits improved space communications, frequency management and surveillance at HF and UHF frequencies.

The satellite experiments will be designed, fabricated, tested and integrated in the DMSP satellite. Software programs will be developed to operate on GWC UNIVAC for rapid transmittal to AWS ionosphere predictions program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0034, GRADUATE STUDENT TRAINING PROGRAM IN OCEANOGRAPHIC REMOTE SENSING
C.D. Hollister, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (NGT 22-014-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space & Terrestrial Applications

5.0035, WARM-WATER MASS FORMATION
Unknown, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (NAG 5-185)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

5.0036, GRADUATE STUDENT RESEARCHERS PROGRAM
J.J. Papike, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Planetary Science, *Stony Brook, New York* 11790 (NGT 33-015-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

5.0037, FAR-INFRARED MEASUREMENTS OF TRACE CONSTITUENTS
I.G. Nolt, Oregon State Higher Education System, University of Oregon, School of Arts & Sciences, Dept. of Physics, *Johnson Hall, Eugene, Oregon* 97403 (NAGW 222)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space & Terrestrial Applications

5.0038, RESEARCH ON ATMOSPHERIC VOLCANIC EMISSIONS
J.P. Friend, Drexel University, School of Science, Dept. of Chemistry, *32nd & Chestnut Sts., Philadelphia, Pennsylvania* 19104 (NAG 1-200)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0039, DEVELOPMENT OF AN INTERACTIVE METHOD FOR REMOTE DETERMINATION OF SURFACE MOISTURE PATTERNS
T.N. Carlson, Pennsylvania State University, University Park Campus, College of Earth & Mineral Sciences, Dept. of Meteorology, *116 Deike Bldg., University Park, Pennsylvania* 16802 (NAG 5-184)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0040, STUDY OF SOLAR FLUX AND ABSORPTION
J.F. Nesbit, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NAS 5-26545)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0041, COMPOSITE MAPPING AND TOPOGRAPHIC ANALYSIS
D. Greenlee, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, EROS Data Center, *Sioux Falls, South Dakota* 57198

Research will continue on operational uses of LANDSAT data. The data will be added to the digital geo-based information collected by the Geography Program land use and land cover maps, Topographic Division (digitized USGS sheets), Defense Mapping Agency, and NCIC (digital terrain tapes), and the Census Department (Dime).

SUPPORTED BY U.S. Dept. of the Interior, Land Information & Analysis Office, EROS Data Center

5.0042, RANGELAND INFORMATION TASK
R.W. Newton, Texas A & M University, College Station Campus, Remote Sensing Center, *College Station, Texas* 77843 (NAS 9-16369)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

5.0043, ROCK PHYSICS
R. Stewart, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (9-9960-01181)

STATE TO WHICH PROJECT PERTAINS: California.

Work will be confined to preparing a report of previous experimental work and some analysis of new velocity data from wells near the San Andreas fault.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0044, SYNTHETIC SULFUROUS MAGMAS - UNDERSTANDING SULFUR SYSTEMATIC ON IO
H.D. Schreiber, Virginia Military Inst., Undergraduate School, Dept. of Chemistry, *Lexington, Virginia* 24451 (NAGW-213)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0045, COMPUTER-AIDED IDENTIFICATION AND CLASSIFICATION OF VEGETATION ON THE APOSTLE ISLANDS USING REMOTE SENSING
T.M. Bonnicksen, University of Wisconsin, Madison Campus, School of Natural Resources, Dept. of Forestry, *Agriculture Hall, Madison, Wisconsin* 53706 (0079658; WIS02438)

OBJECTIVE: Identify, classify and digitally map, using a scanning densitometer and associated computer software, the vegetation cover-states on Bear and surrounding Islands from a 1:120,00 color I.R. transparency. Determine the accuracy of the digital vegetation cover-state maps by comparing the digital map for Bear Island with a hand drawn map that is verified with ground data. Evaluate the potential of using computer-aided vegetation mapping techniques for the management of vegetation in national parks and reserves.

APPROACH: A NASA (RB-57F) high altitude (small scale) 1:120,000 false-color infrared transparency of the Apostle Islands has been scanned at 50 Mu intervals in each of four wavelength bands. Digitized data on spectral reflectance values obtained by scanning were processed with computer programs designed to classify these values using a modified clustering technique. The accuracy of the digital display map will be determined by comparing it with the hand drawn map of vegetation cover-states on Bear Island.

SUPPORTED BY Wisconsin State Government

5.0046, NAVY ENVIRONMENT - SUN EARTH EFFECTS
R. Reiter, Physikalisch Bioklimatische Forchungsstelle, *Garmisch Partenkirchen, Federal Republic of Germany* (DN875340; N00014-80-G-0065)

The objective of this research is to provide long term experimental data by which concepts of solar terrestrial reaction mechanisms can be tested and further developed for possible application to weather prediction techniques for naval operations.

The approach is largely experimental through careful daily and longer period observations that appear to be related to solar events. These observations include neutron monitoring as a measure of the flux of galactic cosmic rays, ozone profiles and integrated ozone measurements of the atmosphere, radio actinide measurements to detect stratospheric infusions, ion production rates in the upper atmosphere to detect change in flux of ionizing radiation or particles, and several other related measurements. These observations are made in the relatively clean air from mountain top observatories in the German Alps.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, DEVELOPMENT OF A METHODOLOGY FOR AIRCREW WORKLOAD ASSESSMENT
J. Buck, Auburn University, Graduate School, *Auburn, Alabama* 36830 (DF325210; F33615-78-D-0617)

The objective of this effort is to establish techniques and criteria for aircrew performance/workload assessment based on job and time standards methods. The method must take into account cognitive as well as motor, or psychomotor, demands of critical aircrew tasks.

Conventional industrial engineering techniques and metrics will be evaluated in the light of aircrew functions and associated tasks to identify necessary adaptations or additions to assure compatibility of industrial practices with Air Force operations. Criteria for assuring the effectiveness of any required modifications or additions to conventional techniques will be established. The criteria will be applied to preliminary tests of the effectiveness of the adapted methodology for a selected aircraft. The resultant method will be appropriate for generating data inputs to a computer-based data bank compatible with man-machine system modeling requirements. Initial emphasis will be on single-place aircraft. Task analytic data, time-line analyses, and an aircraft simulator will be used to support the methodology development and verification process.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0002, TRANSFER EFFECTIVENESS OF SIMULATOR MOTION AND SIMULATED IFS FIELD OF VIEW
R.B. Brooks, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223030)

To compare the levels of skill acquisition and training transfer for selected basic and instrument flight maneuvers as a function of platform motion (full versus no motion) and field of view (full vs. simulated IFS) using ASUPT.

The research will be conducted in two phases. In phase I each group of four UPT students will receive ASUPT training under one set of conditions on selected contract flying maneuvers including takeoffs, straight-in and pattern landings. The four conditions are: 1. Full platform motion and full (ASUPT) field of view, 2. Full platform motion and restricted (ATC/IFS) field of view, 3. No platform motion and full field of view, and 4. No platform motion and restricted field of view. Performance in ASUPT will be measured via the ASUPT automated performance measurement system and IP ratings. Transfer will be measured by IP rating on an expanded 12-point scale. Phase II of the research will emphsize instrument flying skills including GCAS. The same students used in phase I will receive additional ASUPT training. The procedure in phase II will be similar to phase I except half the subjects receiving the no-motion and half receiving the full platform motion in phase I will receive the full platform motion treatment in phase II. The remaining subjects will receive the no-motion treatment in this phase.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, ADVANCED-FIGHTER RESEARCH PLANNING
E.L. Martin, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF224280)

To define critical research issues which impact the design of advanced-fighter training systems and to develop a plan which addresses these research issues using the modified capabilities of the ASPT. It is anticipated that the research program will focus on training syllabus development, performance measurement development, visual and force cue requirements, and instructor-operator station design requirements with emphasis on those features unique to the F-16 aircraft.

A research team within FT shall be formed for the development of the research plan and shall take into consideration status of the F-16 training system, projected ASPT capabilities and engineering development schedules, and user organizations requiring information which might be provided as a result of the research effort. Following formation of the research team and their orientation to the weapons system, user organizations shall be contacted for the purpose of identifying a potential set of research issues. From this data, a preliminary research plan shall be drafted and a planning conference hosted for its revision. Based on these revisions, the draft plan shall be forwarded to participating organizations for final review. The final plan shall become the basis of the research program to be accomplished using the ASPT.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0004, AN EXPERIMENTAL MODEL TO PREDICT THE DEGREE OF CIRCADIAN RHYTHM DISRUPTION FOLLOWING ALTERATIONS OF RES-ACTIVITY CYCLES
D.C. Holley, California State University & Colleges, San Jose State University, School of Science, Dept. of Biological Sciences, *Washington Sq., San Jose, California* 95192 (NCC 2-141)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0005, CONSTRUCTION OF IMPROVED MEASUREMENT SYSTEM
C.R. Steele, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCC 2-145)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0006, CONFERENCE ON THIOREDOXINS
B.B. Buchanan, University of California, Berkeley Campus, School of Letters & Science, Dept. of Cell Physiology, *Berkeley, California* 94720 (NAGW 211)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

6.0007, MODELS OF ENERGY TRANSFORMATION DURING THE EARLY EVOLUTION OF LIFE
T.K. Lanyi, University of California, Irvine Campus, Graduate School, *Irvine, California* 92664 (NAGW 212)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

6.0008, CALCIUM METABOLISM AND CORROLATED ENDOCRINE MEASUREMENTS IN PRIMATES DURING COSMOS
Unknown, University of California, San Francisco Campus, Graduate School, *551 Parnassus Ave., San Francisco, California* 94122 (NAS 2-10927)

SUPPORTED BY U.S. National Aeronautics & Space Admin.

6.0009, 450 MHz CIRCULAR PARALLEL PLATE RODENT EXPOSURE DEVICE FABRICATION
J.C. Toler, Southeastern Center for Electrical Engineering Education Inc, *Orlando, Florida* 32809 (DF326570; F33615-78-D-0617)

A 435-MHz RFR exposure device appropriate for performing experiments involving exposure of up to 100 rodents to average power densities of 1mW/sq. cm shall be constructed.

Contractor shall fabricate an exposure system composed of 4 circular parallel plate devices (about 4 meters in diameter) with a slotted-cylinder feed approximately 45 cm long and 10 cm in diameter. In addition to the 435-MHz exposure device, 230 non-RFR interfering rodent exposure cages shall be constructed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0010, SENSORY INTERACTIONS AFFECTING HUMAN PERFORMANCE IN NAVAL MOTION ENVIRONMENTS
F.E. Guedry, U.S. Dept. of Defense, Navy, Naval Aerospace Medical Research Lab., *Pensacola, Florida* 32512 (DN877426)

Aircraft and ship motions frequently induce uncorrelated or dissonant inputs from the motion sensors, thereby yielding responses inappropriate to the state of motion and increasing probability of control errors and of motion sickness. Our objective is to investigate interactions among these sensory systems to develop predictive principles and reference data for optimizing performance in Navy motion environments.

Dynamic response data for different motion sensors will be used to select combinations of stimuli that yield (1) correlated sensory inputs and (2) discordant sensory inputs. Stimulus sets that enhance performance and perceptual accuracy will be studied in contrast with sets that produce inefficient responses. Descriptions of responses and principles derived will be considered in relation to ship and aircraft operations (sensory/performance tasks). Subjects: military.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

6.0011, EFFECT OF DECREASED GRAVITY ON CIRCULATION IN THE RAT
V.P. Popovic, Emory University, School of Medicine, Dept. of Physiology, *1364 Clifton Rd. N.E., Atlanta, Georgia* 30322 (NAG 2-87)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0012, ANALYSIS OF LIFE-SUPPORT LOGISTICS PLANNING NEEDS
Peterson, Purdue University, Graduate School, *Executive Bldg., West Lafayette, Indiana* 47907 (DF324250; F33615-78-D-0617)

The study will identify methods of implementing the principles of design to cost, life-cycle costing and predictive modeling to life-support equipment logistics using special USAFSAM capabilities to reduce the rate of operational and support cost inflation.

This analysis will be performed as a post-doctoral study.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0013, BIOTELEMETRIC ANALYSIS OF PEDIATRIC LONG-BONE RECONSTRUCTION
R.J. Pawluck, Columbia University, College of Physicians & Surgeons, Dept. of Orthopedic Surgery, *630 W. 168th St., New York, New York* 10032 (NCA 2-172102)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0014, GRADUATE STUDENT RESEARCHERS PROGRAM

R.A. Jensen, State University of New York, Binghamton Campus, School of Science & Mathematics, Dept. of Biological Sciences, *Vestal Parkway E., Binghamton, New York* 13901 (NGT 33-188-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

6.0015, LDF 79-5, TARGET ACQUISITION UNDER VIBRATION AND HIGH-GRAVITY FACTORS

A.P. Ginsburg, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF325220)

The Air Force needs to understand target acquisition under the operationally important conditions of vibration and high-gravity (g) forces. Vibration can cause a blurring of the perceived image and discomfort may interfere with observer attention and/or decision processes. High g-stress may also cause similar problems in addition to reduced peripheral vision. A series of experiments is proposed to determine the human spatial filtering properties and investigate the identification of simple and complex targets during vibration and high g-forces. Furthermore, detection and identification thresholds of targets of a stationary observer viewing vibrating targets, for example, on a vibrating display, will also be undertaken. Since the physics of the observer are different under those two conditions, then different results are expected for target detection and identification.

Devices capable of satisfying technical objectives are not commercially available. Presently available variable contrast devices capable of measuring contrast thresholds of objects will not withstand vibration. Thus, a variable contrast device capable of operation under sustained vibration and high g-stress will be created under contract. The initial design concept will be to use a cross-polaroid system that under operator, subject, or computer control, allows the change of contrast of any slide imagery without changing the mean luminance of the stimulus. Base-line studies will determine the contrast sensitivity of sine wave gratings and the detection and identification of complex targets, e.g., aircraft, under static viewing conditions. The contrast sensitivity measurements will define the threshold contrast sensitivity of the subject. The data will be related to the detection and identification of complex objects. Next, studies will be made under conditions of vibration and induced high g-forces. The vibration platform and the centrifuge facility at AMRL will be used to create vibration and g-force conditions. The difference between the contrast sensitivity measurements under static and dynamic conditions will provide a quantitative description of visual sensitivity to certain spatial frequencies which in turn will be related to the differences between target detection and identification under those static and dynamic conditions. This effort is supported by O and M contract documented under workunit NR. 71840006.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0016, CONDUCT AIR AND GROUND CREW NOISE STUDIES TO EXPAND/UPDATE USAF BIOENVIRONMENTAL NOISE DATA BANDBOOK

H.K. Hille, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321420)

USAF aircraft and equipment operations generally produce adverse noise levels at flight crew, passenger, and ground crew locations which must be evaluated with respect to hearing risk, ear protection requirements, voice communication capabilities, facility siting problems, etc. The objective of this workunit is to expand and update the USAF Bioenvironmental Noise Data Handbook (developed under workunit 72310418) and, thereby, provide the data necessary to define these physical noise environments for use by MAJCOM/airbase bioenvironmental engineers, flight/ground safety officers, and others concerned about personnel safety and effectiveness.

The technical approach is to conduct field measurements, perform spectral analyses, and then apply NOISEBANK, the most advanced OMEGA software, and AFR 161-35 exposure limits, to compute the required physical and psychoacoustic measures.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Biodynamics & Bionics Div.

6.0017, JTIDS SYMBOLOGY AND WORKLOAD

W.H. Pearson, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF323380)

The Symbology Standardization Committee (SSC) of the ESD JTIDS SPO has recommended symbology to be used on a joint tactical information distribution system (JTIDS) display during a flight test of the design concept. The objective of this workunit, in compliance with further recommendations of the SSC, is to evaluate the proposed symbols, identify symbols which can be processed more rapidly, and evaluate the workload imposed by use of the JTIDS display in a simulated tactical environment. A summary and synthesis of pertinent literature will also be prepared.

A progressive series of related experiments has been planned ranging from research obtained under a 6.1 program effort (experiment 1) to a system simulation (experiment 4). They are (1) printed (white on black) versions of the candidate symbols which will be evaluated experimentally on a sample of subjects using a modified paired-comparison technique to obtain discriminability indices. (2) Samples from populations of differing experiential background (e.g., pilots familiar with other symbology, fighter-bomber pilots, and non-military subjects) will be required to construct symbols representing tactical intelligence events, objects or conditions. The most common symbols will be selected for further evaluation. (3) The candidate symbol sets generated via (1) and (2) above will be tested further in an experiment in which the time required to establish associations between symbols and objects, events, or conditions will be obtained. (4) A part-task JTIDS mission simulation will be developed and used to test the compatibility of JTIDS task demands with other pilot tasks.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0018, MILITARY SPECS AND STANDARDS

J.M. Ring, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320990)

There are two objectives: (1) to provide human engineering application, support and consultation at any and all stages of development - initial conception, concept evaluation, conceptual design, formulation, acquisition, testing, trouble shooting, and maintenance of systems and subsystems, and (2) to collect human factors research data and convert it into forms such as specifications, standards and handbooks that are directly usable by weapons system management and design personnel.

A diversified group of human factors specialists is maintained to respond to requests for assistance from AF, other government organizations, industry, and allied forces. The group assists in formulating the problem and makes recommendations for equipment design and for airborne and laboratory procedures, tests and evaluations, literature searches, data collection, and in-house and contract research programs. As requests for this HE expertise are received, the effort is recorded under this workunit until such time as the effort is sufficiently large to require its own documentation. This workunit provides human engineering participation to the (1) AFSC Human Engineering Panel, (2) revision of human engineering specs and standards, MIL-H-46855 and MIL-STD-1472 respectively, (3) revision of DH1-3, Human Factors Engineering, and (4) Aircrew Station Standardization Panel. The results of the above efforts are utilized throughout the Air Force in the development of Air Force systems and equipment by incorporating them in contractual documents. In addition, MIL-H-46855 and MIL-STD-1472 are coordinated and used by all three services.

SUPPORTED BY U.S. Dept. of Defense, Aerospace Medical Research Lab., Human Engineering Div.

6.0019, INHABITATION BY CAMP BY LYMPHOCYTE PLASMA MEMBRANE ENDOGENOUS PHOSPHORYLATION STUDY
R. Nordguist, University of Oklahoma, Health Sciences Center, Graduate School, *Box 26901, Oklahoma City, Oklahoma* 73190 (NAG 9-18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0020, STUDY OF BEHAVIORAL MODIFICATIONS RESULTING FROM EXPOSURE TO HIGH LINEAR ENERGY TRANSFER (LET) RADIATION
D. Hightower, Texas A & M University, College Station Campus, School of Veterinary Medicine, Dept. of Veterinary Physiology & Pharmacology, *College Station, Texas* 77843 (NAS 9-16375)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0021, SCREENING OF PROSPECTIVE AIR TRAFFIC CONTROLLER OPERATORS
D. Hunter, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Brooks Air Force Base, San Antonio, Texas* 78235 (DF233970)

To develop a controller oriented screening device for air traffic control (ATC) applicants. Present requirements are AQE score of 60 or better in administrative or general and a class II physical exam (including ARMA), neither of which appear to be positive indicators of eventual success in the air traffic control field.

Analyzing the results from a 1975 FAA exam administered to ATC (27230) students at Keesler and of AQE scores, against performance in the ATC field, determine what factors in test batteries are predictive of success in the career field. Develop new screening device based upon the prediction parameters and employing current and advanced testing technology.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0022, TEST AND EVALUATION OF CHEMICAL DEFENSE EQUIPMENT AND EXTREME CHANGES IN COCKPIT ENVIRONMENT
R.W. Krutz, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322610)

Previous efforts in this area were documented under workunit 7930-09-15. The purpose of this effort is to conduct in-house test and evaluation of chemical defense personnel equipment in direct support to the 412A Life Support SPO, Chemical Defense Division (AEL). The workunit is structured to address biomedical and environmental test requirements that are expected to arise during various stages of new equipment development and modification of existing equipment by the SPO. The capability to conduct quantitative leakage assessment of CD respiratory devices will be established and the chemical properties of CD filter materials will be studied for their compatibility with the flight environment. The justification for establishing this supportive effort is based upon an approved memorandum of agreement between AMD and ASD/AEL (30 Jun 76), and TAF (ROC) 326-75, 7 Nov 75 (CW mask for tactical fighter aircrew). The MOA states that T&E support will be provided on a cost reimbursement basis, the latter defined as a specific cost schedule in AMD letter to ASD/AEL, 9 Feb 76.

The workunit monitor will serve as the OPR for the CD program to be accomplished within the USAFSAM. He will plan programs and coordinate all T&E activities to be accomplished by various organizations within the laboratory. However, laboratory elements at both the USAFSAM and AMRL will charge against this workunit to insure proper reimbursement. Specific areas of test and environmental simulation will consist of altitude exposure, including pressure breathing levels and rapid decompression, respiratory impedance measurements, thermal/cold effects, air combat manuevering (ACM) g exposures, mask-leakage characteristics, equipment-related performance decrement, and integration with other life-support equipment and cockpit configurations. Realistic operational profiles for the environmental conditions will be simulated and the sodium chloride cloud technique will be utilized for lead testing purposes (actual CW agents, simulants or antidotes will not be used for any tests). The OPR and others will also provide biomedical consultation and review technical requirements for equipment design when requested.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0023, COLD STRESS AND IMMERSION - ASSESSMENT OF PROTECTIVE MEASURES
M.A. Orzech, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF320170)

The goal is to optimize anti-exposure protection for USAF operations over cold water. ASD has requested realistic guidance which will allow operational units to select a clothing ensemble which causes minimal encumbrance consistent with reasonable safety standards. These will take the form of tables entered with water temperature and predicted maximal pick-up time.

A stepwise approach is necessary, as follows: (1) determination of air and water CLO values (performed at USARIEM per MOA), (2) preliminary guidance to field, (3) development of computer model for prediction of self-help and survival limits, (4) validation of same, and (5) revision of field guidance. All work is being coordinated with USN (NADC).

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0024, VALIDATION OF PERSONALITY INVENTORY TESTS FOR IMMEDIATE RISK FUNCTION OF AIRCREWMEMBERS WITH POTENTIAL CARDIOVASCULAR DISEASE
M. Thomas, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321900)

This effort is part of an overall immediate risk function evaluation of aircrewmembers to identify those at high risk for a coronary event. The predictability of personality inventory tests will be defined and correlated with the immediate risk function probability of other risk factors. As a result of this work, a test will be defined for use in the general flyer population.

Personality inventory tests will be given to aircrewmembers who will be classified according to various personality types. The results will be correlated with the presence or absence of risk factors, clinical evaluations including coronary arteriography, and stress testing. This work was formerly documented under 7755-01-05.

SUPPORTED BY U.S. Dept. of Defense, School of Aerospace Medicine, Clinical Sciences Div.

6.0025, EVALUATION OF HUMAN PERFORMANCE IN AIR DEFENSE SYSTEMS (TECH BASE)
C.W. Howard, U.S. Dept. of Defense, Army, Research Inst. for the Behavioral & Social Sciences, Personnel & Training Research Lab., *Box 6057, Fort Bliss, El Paso, Texas* 79916 (DA0G0164)

(a) To obtain quantitative Patriot console operator measures of performance including analysis of differences among operator performance. (b) To investigate differences in operator performance as a function of individual differences in cognitive style, aptitudes, abilities, and personality.

(a) For air defense units to accomplish their mission of protecting friendly assets from enemy air or missile attack, air defense units must be composed of well chosen, well trained individuals equipped with reliable and effective air defense weapons. Satisfaction of these criteria for mission success dictates a vigorous research program to achieve (1) operational definitions of criteria for effective performance, (2) methods for both more effective personnel selection, and (3) proficiency maintenance to sustain a combat ready force posture. (b) Recent training and doctrine command (TRADOC) emphasis on analyzing training effectiveness generated immediate research requirements for the

air defense community. The first of these is the determination of what constitutes effectiveness of air defense gunners and operators, or more precisely, what valid operational definitions of effectiveness (i.e., those which may be measured in a peacetime environment) exist and how might they be measured within the constraints of available resources and facilities.

SUPPORTED BY U.S. Dept. of Defense, Research Inst. for the Behavioral & Social Sciences, Personnel & Training Research Lab.

6.0026, GRADUATE STUDENT RESEARCHERS PROGRAM
M.J. Correia, University of Texas, Medical Branch at Galveston, School of Medicine, Dept. of Physiology & Biophysics/Otolaryngology, *300 University Blvd., Galveston, Texas* 77550 (NGT 44-088-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, SOFTWARE PARTITIONING SCHEMES FOR ADVANCED SIMULATION COMPUTER SYSTEMS
S. Clymer, Teledyne Brown Engineering Co. Inc., *Cummings Research Park, Huntsville, Alabama* 35807 (DF228570; F33615-78-C-0013)

To develop design concepts for a technique, tailed to flight simulation problems, that will automatically divide a large software system into tasks that can be executed in parallel on multiple processor systems. The work will result in a set of guidelines for an automatic software partitioning scheme that can also identify interdependencies and communication links between tasks and determine methods of execution to prevent system deadlocks.

A complete simulator analysis will be conducted to determine the design goals and input/output parameters for a software partitioning technique. This includes an analysis of the hardware and software aspects of real-time flight training simulators to identify the factors which influence how the software should be partitioned. The basis for the software analysis will be a benchmark simulation problem to be supplied by the Air Force. The hardware analysis will be based on conceivable computer and peripheral configurations for simulation to be identified by the contractor. Using this data, a set of design goals will be developed for a software partitioning technique. The input and output parameters necessary for this technique to achieve the design goals will be developed. The design of the software partitioning technique will then be developed to the point that it is automated to the maximum extent possible and can be demonstrated by hand. Simulator analysis, 8 MAC, develop model parameters, 10 MAC, algorithm development, 15 MAC, contract end, 18 MAC. Alex Shaw is the co-monitor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

7.0002, GRAPH ALGORITHMS - KEY TO IMPROVED COMPUTING METHODS IN ENGINEERING PROBLEMS
R.E. Tarjan, Stanford University, School of Humanities & Sciences, Dept. of Computer Science, *Stanford, California* 94305 (DN675391; N00014-76-C-0688)

After the calculus, the single most important concept in modelling engineering design and particularly operations analysis problems is the concept of a graph (a collection of 'nodes' connected by 'edges'). Graphs are used, and graph theoretic algorithms must be devised in electronic circuit design, the design of both communications and logistics networks, the analysis of a great variety of computational algorithms (e.g., for information retrieval), and the flow analysis of the computer programs which implement these algorithms. Graph theoretic notions have recently become very important in the study of techniques for the solution of sparse matrix problems. Sparse matrix techniques are often the key to the solution of important Navy fluid dynamics problems, both problems of geophysical fluid mechanics (weather and oceanographic modelling) and fluid problems arising in ship and aircraft design. This project will develop improved computer procedures for the solution of the graph problems generated in the above applications.

This effort will develop general methods which can be applied to the efficient solution of a variety of specific graph problems. The project will also apply these general methods to specific problems. In addition, analyses of the relative computational efficiency of various algorithms will be carried out.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

7.0003, GRADUATE STUDENT RESEARCHERS PROGRAM
F.H. Shu, University of California, Berkeley Campus, School of Letters & Science, Dept. of Mathematics, *Berkeley, California* 94720 (NGT 05-003-800)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

7.0004, GRADUATE STUDENT RESEARCHERS PROGRAM
J. Dozier, University of California, Santa Barbara Campus, School of Engineering, Dept. of Computer Science, *Santa Barbara, California* 93106 (NGT 05-010-801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

7.0005, COMPUTER GENERATED IMAGERY TECHNIQUES EVALUATION
D. Cohen, University of Southern California, Information Sciences Inst., *Marina Del Rey, California* 90291 (DN794044; N61339-77-C-0154)

The objective of this task is to conduct a state-of-the-art survey on the application of computer generated imagery (CGI) to flight simulation devices, make a technological forecast of advances, and assess the future of this technology and its impact on Navy flight training in the early 80's.

The survey will address the following issues: (a) state-of-the-art, (b) human factor aspects, (c) expected future progress, and (d) probable impact of new technology.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Computer Systems Lab.

7.0006, SOFTWARE RELIABILITY MODELS FOR FAULT-TOLERANT AVIONICS COMPUTERS AND RELATED TOPICS
D.R. Miller, George Washington University, School of Engineering & Applied Sciences, Dept. of Operations Research, *725 23rd St. N.W., Washington, District of Columbia* 20037 (NAG 1-179)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0007, MODELING OF FAULTS FOR VALIDATING THE FAULT-TOLERANT COMPUTER SYSTEMS
S.M. Reddy, University of Iowa, School of Engineering, Dept. of Electrical & Computer Engineering, *Jessup Hall, Iowa City, Iowa* 52240 (NAG 1-195)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0008, PROVIDE COMPUTER TIME
T. Byther, University of Maine, Orono Campus, School of Sciences & Engineering, Dept. of Computer Science, *Orono, Maine* 04473 (NAS 5-26574)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

7.0009, WAVES IN TURBULENT MEDIA AND RANDOM LINEAR HYPERBOLIC SYSTEMS (15452-M)
T.C. Sun, Wayne State University, School of Liberal Arts, Dept. of Mathematics, *4841 Cass Ave., Detroit, Michigan* 48202 (DA0F9164; DAAG29-78-G-0042)

To study wave propagation in time-dependent random media with special stress on effects of turbulence on the statistical properties of wave parameters. Relevance: Study of time-dependent wave propagation is of practical importance to radio and optical communications systems. Specifically, the proposed work may provide better quantitative tools for measuring wave propagation of radio waves in the ionosphere and pulsed-laser beams through the atmosphere.

Develop asymptotic and approximate methods for random partial differential equations.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

7.0010, NATURAL LANGUAGE INPUT FOR COMMAND AND CONTROL COMPUTER SYSTEMS
L.R. Harris, Dartmouth College, School of Arts & Sciences, Dept. of Mathematics, *P.O. Box 833, Hanover, New Hampshire* 03755 (DN223811; N00014-75-C-0514)

The Navy has need for the development of normal natural language input to computers, and for control of robotic type devices. This task has the goal of developing generalized techniques for providing natural language input and processing to fit various applications.

The approach is to continue research in natural language input and processing by developing techniques that will extend current capabilities in the following three areas: dealing with new linguistic phenomena, performing a wider range of post-processing of the data, and interfacing to other data base management system structures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

7.0011, STATISTICAL COMMUNICATION THEORY AND ROBUST ESTIMATION
S. Cambanis, University of North Carolina, Chapel Hill Campus, School of Arts & Sciences, Dept. of Statistics, *Chapel Hill, North Carolina* 27514 (DF040530; AFOSR-80-0080)

AF function - communication systems and signal processing. Ranking and selection procedures for industrial and military components. Deficiency - improvements are needed in the techniques of identification and representation of signals observed through nonlinear devices. The need is obvious for robust methods in linear model applications as well as easy to apply ranking and selection sequential rules for selecting the best systems as compared to a standard. Objective - improve the understanding of the operations and make possible the development of communications systems and further develop signal processing methodology. How work contributes - the research suggested will allow for better design of communication systems and signal processing techniques.

The proposed research in the area of statistical communication theory and the analysis of stochastic signals and systems includes the study of nonlinear systems with random inputs, system analysis and identification-nonlinear systems, inverse problems - analysis of some delta modulation and differential pulse code modulation systems. The proposed research in the area of robust estimation for linear models includes the study of estimation of regression coefficients in the heteroscedastic linear model, when the variances are unknown and unequal-estimation of regression coefficients in a linear model when the observations are distorted by random variation and/or measurement error estimation of autoregression coefficients when the signal is distorted by noise.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0012, PRACTICAL METHODS FOR THE COMPENSATION AND CONTROL OF MULTIVARIABLE SYSTEMS
P.L. Falb, Brown University, Graduate School, Dept. of Applied Mathematics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DF046610; AFOSR-77-3182)

AF function - a study of control methods for high-performance aircraft, helicopters and ballistic missiles. Deficiency - compensation and control of the above systems. Objective - the primary objective of this research effort is the development of practical methods for the compensation and control of multivariable systems. How work contributes -success in this area would facilitate the design of Air Force systems as well as their control systems.

Depending on the degree of parameter uncertainty or variation, several different approaches have been used. Several crucial themes representing the various approaches occur throughout the current and proposed study, namely: (1) the question of approximation of dynamical behavior by simplified models, (2) the question of parameter variation and the development of compensators which are insensitive to that variation, and (3) the question of systems structure and qualitative properties for parameterized models and interconnected systems. The amplification and application of a previously developed model reference technique to the question of approximation via low order models will be investigated. Systems with parameters will be examined and three main lines of investigation considered, namely: (1) the relation between the geometric and polynomial matrix approaches to parameter-insensitive compensation and parameterized models, (2) the algebra-geometric method for treating multi-dimensional systems, i.e., systems with transfer matrices defined over a polynomial ring in N-variables, and (3) the use of rational mappings in studying what might be termed the algebraic linearization of certain non-linear systems. Interconnected systems will be examined and a number of questions relating to decentralized spectrum assignment, stabilization, and the structure graph of an interconnected system will be raised.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0013, BURGERS' APPROXIMATION FOR TWO-DIMENSIONAL FLOW PAST AN ELLIPSE
J.M. Dorrepall, Old Dominion University, School of Sciences & Health Professions, Dept. of Mathematical & Computing Sciences, *P.O. Box 6173, Norfolk, Virginia* 23508 (NAG 1-197)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

7.0014, CALIBRATION OF STELLAR LUMINOSITIES FROM TRIGONOMETRIC PARALLAXES
T.E. Lutz, Washington State University, School of Arts & Sciences, Dept. of Pure & Applied Mathematics, *Administration Bldg., Room 101, Pullman, Washington* 99163 (AST80-02421)

Recent theoretical work appears to place stringent limits on the sizes of parallaxes which can be used for the calibration of stellar luminosities. A recently developed multivariate density relating apparent magnitude, true parallax, and observed parallax suggests a method by means of which it may be possible to utilize all of the available parallax data (including small and negative values) for luminosity calibration. Because of the complexity of the equations it does not appear likely that an analytic solution can be found and the analysis will have to be performed with a computer using Monte Carlo techniques. The proposed research has the potential for increasing the number of stars which can be used for luminosity calibration by an order of magnitude.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, ION PHOTODISSOCIATION AND PHOTOFRAGMENT SPECTROSCOPY
J.T. Moseley, S R I International, *333 Ravenswood Ave., Menlo Park, California* 94025 (CHE77-00428)

Research on molecular ion structure and potential surfaces will be performed using techniques of photodissociation and photofragment spectroscopy, as begun under grant CHE-6510085. The 2 sigma plus equals 2 pi g and 2 sigma g plus potentials of F2 minus equals C12 minus, and Br2 minus will be studied in the same manner as current studies on Ar2 plus and Kr2 plus. In these studies it was discovered that the effects of spin orbit coupling on the photodissociation cross-sections and the photofragment angular distributions were much more important than had been previously realized. Therefore, particular attention will be given to these effects. Predissociations of polyatomic ions such as CO3 minus equals O3 minus, O3 plus, and N2O plus will also be investigated, and excited states identified, vibrational spacings measured, and lifetimes determined where possible. A detailed study of the threshold photodissociation of O plus (a s pi a) which is already underway, will be completed. This study will yield significant new information about the pi 2, b4 sigma g and f4 sigma g states of O2 plus, and about the mechanisms of near threshold photodissociation. A search will be conducted for this effect in other ions where it might be expected to occur.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0002, THEORETICAL SOLID-STATE PHYSICS
M.L. Cohen, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (DMR78-22465)

Research previously supported by DMR7620647.

Theoretical research will be carried out in several areas of solid-state physics. These will include: (1) The estimate of local field effects, and the consequences for the theories of excitonic superconductivity and lattice dynamics. (2) The electronic structure of heterojunctions. This will involve the determination of the surface states at the interface between two semiconductors. (3) Total energy calculations, which will be particularly important for the estimate of surface relaxation. (4) The electronic structure of superconductors. This study will concentrate on the band structures of copper chloride, which has been suggested as possibly having a high transition temperature, and the A15 compounds. (5) The theory of the electron-phonon interaction and its effect on the transition temperature superconductors. (6) The electronic structure of adsorbates on solid surfaces. (7) The development of first-principles' pseudopotentials. (8) The theory of the motion of Bloch walls in ferromagnets. (9) The electronic states of muonium and electron-hole drops in semiconductors.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0003, SMALL SOLID PARTICLES IN BEAMS
W.D. Knight, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (DMR78-12629)

A source capable of producing atomic clusters of uniform size has been constructed and successfully operated. Potassium cluster ranging from a single atom to five-hundred atoms can be formed into a moleuclar beam with a uniform velocity distribution, and can be analyzed by magnetic deflection and mass spectroscopic analysis. The electronic structure of these small particles will be studied by spectroscopic methods and compared with current theories for small particles. Of particular interest is the variation of the electronic structure with increasing particle size. The adsorption of atoms or molecules on the surface of the cluster will be studied, providing a convenient test for theories of chemisorption. Similarly, the interaction of the conduction electrons in a particle with a single magnetic impurity atom will be investigated as time permits. This is a continuation of the research supported by DMR 7522607.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0004, RARE GASES IN INDIVIDUAL METEORITE GRAINS
J.H. Reynolds, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (INT78-00635)

Funds from this award will make possible a nine-month cooperative research effort, on problems in meteoritics and rare gas analysis techniques between the American principal investigator and Dr. Peter M. Jeffery of the Physics Department of the University of Western Australia.

The investigator will work specifically on the development of miniaturized techniques for studying the rare gas contents of mineral grains separated from meteorites. These techniques will then be used to conduct a critical examination of the iodine-xenon dating method and to search for isotopically anomalous rare gases trapped in carbonaceous meteorites.

Using various approaches in a small vacuum system directly appended to a statically operated mass spectrometer, the investigators hope to make meaningful xenon measurements on small samples of separated mineral grains in order to facilitate answering several important questions about the I-Xe dating method. Without answers to these questions, further substantial progress in using the I-Xe method for studying the chronology of the early solar system will be impeded.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0005, HEAVY PARTICLE, PASSIVE, PERSONNEL DOSIMETRY USING, ETCHED PARTICLES
E.V. Benton, University of San Francisco, School of Science, Dept. of Physics, *2130 Fulton, San Francisco, California* 94117 (NAS 8-34340)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
George C. Marshall Space Flight Center

8.0006, STUDIES OF TWO-PHOTON EXCITATION AND COLLISIONAL PROCESSES IN MOLECULAR HYDROGEN AND OTHER SIMPLE ATOMIC AND MOLECULAR SYSTEMS
C.K. Rhodes, University of Illinois, Chicago Circle Campus, School of Liberal Arts & Sciences, Dept. of Physics, *601 S. Morgan St., Chicago, Illinois* 60680 (PHY78-27610)

Experiments to examine the properties of electronically excited H2 have been successfully performed using two-photon excitation of the E, F1 sigma g state from the ground X 1 sigma g level. This work will be extended to a more general analysis of electronically excited molecular hydrogen and its isotopes, to include gaseous phase photoexcitation studies of H2 and HD; an examination of collisional phenomena involving quenching, electronic energy transfer, and reaction; an appraisal of photoionization; and possibly the observation of excited state collisions. These data should provide considerable insight into the structure of the excited states of the most fundamental molecule as well as provide a favorable basis for comparison with theoretical scattering and reaction calculations.

Equivalent experimental techniques can be applied to the study of molecular hydrogen impurities in cryogenic liquids. These studies will provide fundamental information on the nature of these elementary molecular excitations in high-density media under conditions for which no data exist whatsoever.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0007, INVESTIGATING THE MEASUREMENT OF THERMAL CONDUCTIVITY OF SYNTHETICALLY GROWN DIAMOND THIN FILMS
R.E. Taylor, Purdue University, School of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (NAS 3-22529)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

8.0008, GRADUATE STUDENT RESEARCHERS PROGRAM
W.H. Lewin, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NGT 22-009-902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

8.0009, PROPERTIES OF FLUID HELIUM NEAR CRITICAL POINTS
H. Meyer, Duke University, Graduate School, Dept. of Physics, *Durham, North Carolina* 27706 (DMR77-20827)

This research continues and extends a program currently supported under NSF grant DMR75-22615.

The research program comprises studies of 1) Concentration susceptibility of 3He-4He mixtures near the liquid-vapor critical point. 2) The thermal diffusivity ratio, mass diffusion and thermal diffusion in 3He-4He mixtures along the lambda line and near the tricritical point. 3) The thermal diffusivity ratio and mass diffusion in 3He-4He mixtures near the liquid-vapor critical point. 4) Thermal conductivity of 3He, 4He and 3He-4He mixtures near the liquid-vapor critical point. 5) Critical sound attenuation and dispersion of a 3He-4He mixture near the liquid-vapor critical point.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0010, KINETICS OF DIRECT SOLAR-PUMPED LASERS
H.A. Hassan, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Mechanical and Aerospace Engineering, *Raleigh, North Carolina* 27607 (NCC 1-54)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0011, ATOMIC SCATTERING FROM SOLIDS II
E.D. Thompson, Case Western Reserve University, School of Engineering, Dept. of Electrical Engineering & Applied Physics, *University Cir., Cleveland, Ohio* 44106 (DMR79-01658)

Research previously supported by DMR7681184.

Molecular-solid surface scattering calculations, including both elastic and inelastic effects, will be performed, and, from the results and comparisons with experimental data, the dynamical interactions between the molecule and the solid surface will be ascertained. These dynamical interactions are fundamental to understanding such phenomena as physical adsorption, catalytic reactivity, surface viscous drag, and energy transfer. Surface structure analysis from atomic scattering will be carried out for silicon and other semiconductor materials as data become available.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0012, ELECTRONIC PROPERTIES OF MATERIALS
R.J. Higgins, Oregon State Higher Education System, University of Oregon, School of Liberal Arts, Dept. of Physics, *1472 Kincaid St., Eugene, Oregon* 97401 (DMR78-23011)

deHaas-van Alphen (dHvA) effect spectroscopy will be used in characterizing the electronic properties of materials. The technique samples the conduction electrons as a whole in real space but locally in momentum-space. Spin-resolved dHvA wave-shape analysis will be used to track spin dependent scattering and g-shifts in magnetic impurity systems based upon noble metals and exchange enhanced transition metals. High-sensitivity dHvA spectral analysis will be used to study electronically driven order-disorder phase transitions in Cu3Au. The amplification of small energy shifts due to the high quantum phase will be used to determine how the ferromagnetic energy gap changes as the temperature approaches the critical temperature in ZrZn2.

This is the first year of a three-year continuing grant.

This research was previously supported under DMR 7614878.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0013, ELECTRICAL TRANSPORT IN FERROMAGNETIC METALS AND ALLOYS
L. Berger, Carnegie Mellon University, Mellon College of Science, Dept. of Physics, *4400 5th Ave., Pittsburgh, Pennsylvania* 15213 (DMR78-24679)

Two experiments will be done to observe two newly predicted effects involving the interaction of ferromagnetic domains with electrical currents in pure cobalt. In the first experiment, a direct current crossing the domain walls is expected to cause the coercive field (Hc) of the ferromagnet to decrease and even to vanish. In the second experiment, the dragging of domain walls by a current is expected to be facilitated by the application of a variable magnetic field.

In addition, the magnetoresistance of concentrated Pd-Fe, Pd-Co, Pd-Ni-Fe, Pt-Fe, and Pt-Co alloys will be measured at temperatures down to 4 degrees K. These materials are among the most likely to have a large and technically useful magnetoresistance. Also, the Hall effect of these alloys will be measured. The effect of alloy ordering on magnetoresistance will be studied. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0014, A LONG-RANGE NEUTRINO DETECTOR
K. Lande, University of Pennsylvania, School of Arts & Sciences, Dept. of Physics, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (AST79-08670)

This project will involve support of an experiment for the detection of neutrino and antineutrino bursts emitted by a star as it becomes a supernova. The creation of the supernova involves very large amounts of energy which must be radiated away from the star and much of this energy can be carried by neutrinos. The detection of neutrinos from a supernova explosion will enable one to determine the physical conditions near the center of the star at the onset of the explosion.

The detector will also be able to detect high energy neutrinos from localized stellar sources. One will be able to determine if neutrino oscillations occur for neutrino transits of the earth. The detector will also measure the characteristics of very high energy muons produced by the interaction of cosmic ray primaries in the upper atmosphere. Limits on the lifetime of nucleons such as the proton will also be determined.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

8.0015, MAGNETIC EFFECTS IN POLYATOMIC GASES AND AMORPHOUS METALS
T.W. Adair, Texas A & M University, College Station Campus, School of Science, Dept. of Physics, *College Station, Texas* 77843 (A-288)

Hall effect measurements have been made on splat-cooled amorphous LaGa samples in a temperature range from 4.2 to 300 K and in a concentration range of 16% to 26% Ga where an amorphous phase has been stabilized. The Hall coefficient is positive for the amorphous alloys and exhibits appreciable temperature dependence that has the same sign as that reported for

the electrical resistivities of these samples. At present there is no satisfactory explanation of the positive Hall coefficient in either the amorphous or liquid phase.

The Hall coefficient for Be40Ti50Zr10 (Metglass #2204 of Allied Chemical) has been measured at temperatures of 4.2 K, 77 K, and 300 K. These data indicate that there is no temperature dependence of the Hall coefficient for this material. On the otherhand, the resisitivity of these samples exhibits an anomalous temperature behavior. Over a wide range the resistivity decreases with increasing temperature in contrast with the normal behavior of ordered crystalline metals where the temperature coefficient for resistivity is large and positive. Attempts to understand this behavior have led to a number of different models for the fundamental electronic scattering mechanism in the glass.

SUPPORTED BY Robert A. Welch Foundation

8.0016, EXPERIMENTAL STUDIES OF SUPERCONDUCTIVITY IN AMORPHOUS METALS
D.G. Naugle, Texas A & M University, College Station Campus, School of Science, Dept. of Physics, *College Station, Texas* 77843 (DMR78-25003)

Research on amorphous superconductors initiated under NSF Grant No. DMR-7504364 will be continued and extended. Thermodynamic and electronic transport properties of superconducting amorphous transition metal alloys will be studied as functions of composition, magnetic field and temperature. These measurements will yield data on the electronic density of states at the Fermi level and the Debye temperature, two parameters which occupy a central position in the microscopic theory of the superconducting state. Amorphous foils will be fabricated via a hammer and anvil type 'splat-cooler' while amorphous films will be prepared by means of a high-vacuum code-position technique. Electron diffraction and X-ray techniques will be used to characterize the samples. In the later stages of this research superconductng tunneling techniques will be developed to obtain a direct measure of the superconducting energy gap and data relating to the phonon density of states. This work is important for our fundamental understanding of the microscopic interactions which give rise to the technologically important phenomenon of superconductivity.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, RAMAN SPECTROSCOPY OF VAN DER WAALS AND COLLISIONAL MOLECULAR COMPLEXES
L. Frommhold, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Physics, *200 W. 21st St., Austin, Texas* 78712 (F-600)

Rare gas diatoms, which may be bound ('van der Waals dimers') or free ('collisional complexes'), possess a tensorial polarizability, whose invariants, trace and anisotropy, give rise to polarized and depolarized Raman spectra. The first polarized spectra ever seen of the free helium and neon diatoms, and depolarized Raman spectra of all the rare gases are obtained on an absolute intensity scale, and at gas densities substantially lower than hitherto reported. The wave-mechanical computations, using as input the best available semi-empirical interaction potentials and, in the case of helium, the theoretical ab initio diatom polarizabilities, are shown to reproduce the observed spectra closely. For argon, krypton, xenon, analogous computations of the line-shapes demonstrated a most remarkable, almost exclusive usefulness of the dipole-induced dipole (DID) model of the anisotropy. Earlier observations of apparent inadequacies of the DID model were affected by many-body interferences and do in reality not concern the diatom polarizabilities. The observed envelopes of the van-der-Waals dimer Raman spectra can be used as a direct measure of the dimer concentrations.

SUPPORTED BY Robert A. Welch Foundation

8.0018, A THEORETICAL MODEL STUDY OF TIDAL STRESS AND OTHER HEATING MECHANISMS OF IO
J.O. Lawson, University of Texas, El Paso Campus, School of Science, Dept. of Physics, *El Paso, Texas* 79902 (NAGW 204)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0019, HELIUM LIQUEFIER FOR CLOSED-CYCLE SYSTEM
R.V. Coleman, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (DMR78-10776)

A closed-cycle helium liquefaction system will be obtained to produce liquid helium for use in a wide variety of research programs in Physics, Chemistry and Engineering. A central thrust of the research which uses liquid helium will be in studies of the electronic properties of materials, astronomy, superconductivity, magnetism, electronic devices and properties of liquid helium. This system is important for the economical and efficient operation of the low-temperature research programs.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0020, ACOUSTO-OPTICAL TECHNIQUES IN ULTRASONIC TRANSDUCER CALIBRATION FOR MATERIALS INSPECTION
R.O. Claus, Virginia Polytechnic Inst. & State University, School of Arts & Sciences, Dept. of Physics, *Blacksburg, Virginia* 24061 (NAG 1-192)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0021, GAMMA-RAY AND X-RAY SPECTROSCOPY OF SOLIDS UNDER PRESSURE
R.L. Ingalls, University of Washington, School of Arts & Sciences, Dept. of Physics, *Seattle, Washington* 98195 (DMR78-24995)

This is a continuation of research previously supported under DMR 7621053.

The structure and behavior of materials at high pressure will be investigated by Mossbauer spectroscopy of magnetic materials containing iron-57 and X-ray absorption studies using synchrotron radiation. In the Mossbauer studies, the emphasis is on the pressure dependence of the hyperfine magnetic field and magnetic critical temperature as a function of pressure. In the X-ray absorption studies, the techniques are being refined for use in pressure calibration and pressure dependence of EXAFS (extended X-ray absorption fine structure) parameters in order to study electronic and structural transitions.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, TESTING THE VALUE OF ELECTRONIC TRANSFER OF TIME-SENSITIVE INFORMATION
E.K. Michael, S R I International, Augmentation Research Center, *333 Ravenswood Ave., Menlo Park, California* 94025 (DSI77-19308)

This project will test an innovative electronic alternative to the traditional paper-based communication of scientific and technical information. It concentrates on information which loses value over time; therefore, rapid dissemination is very important. Engineers in several aerospace organizations are provided with facilities for on-line access to a data base created from inputs of relevant, 'time-sensitive' information. Several publishers are participating by converting their regular publication material into the electronic form.

Data on the usefulness of the system will be gathered by pre-test and post-test surveys administered to the subjects and to a control group; and by real time, on-line recording of the engineers' use behavior.

The tests are designed to validate a set of hypotheses regarding the time value of information, reduction of information overload, increase in usefulness of information resources through electronic handling, and improved interaction between the publishers and users.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Information

9.0002, DEVELOPMENT AND MANAGEMENT OF GENERAL AVIATION AIRPORTS
D. Patton, State University & Community College System of Tennessee, Middle Tennessee State University, School of Business, *Murfreesboro, Tennessee* 37132 (315927 (HRB NO.))

The objective of this research includes the development of concise, practical document which provides critical information needed by airport sponsors, mayors, airport commission members, and county judges to make decisions as to the most productive use of land and the most effective management system for the development and operation of a general aviation airport. When completed the manual will be distributed to those listed above.

SUPPORTED BY Tennessee State Government

9.0003, ASSEMBLY COST FOR COMPOSITE STRUCTURES
D.T. Wesolka, General Dynamics Corp., *P.O. Box 748, Fort Worth, Texas* 76101 (DF140250; F33615-77-C-3076)

The Air Force, in order to maintain air superiority, must obtain advanced aerospace vehicles and modify existing systems. Reliable cost and weight analysis is required if these systems are to have the minimum cost for the acceptable level of performance. The objective of this effort is to develop a preliminary design level technique for the cost estimation of advanced composite flight vehicle structures. This will provide a high level of confidence in the cost of composite construction.

This study will integrate and expand on previously developed methodology provided by the Air Force contract F33615-75-C-3103 and will support the development of the structural technology evaluation program. The model will use the industrial engineering standards approach which will generate the desired confidence and provide a high-quality cost estimate.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics· Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SPECKLE INTERFEROMETRY APPLIED TO ASTEROID AND OTHER SOLAR SYSTEM OBJECTS
E.K. Hege, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAGW 224)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0002, OBSERVATIONS OF VERY HOT WHITE DWARFS WITH EINSTEIN
J.W. Liebert, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAG 8-403)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0003, NEAR SIMULTANEOUS OBSERVATIONS OF OVV QUASARS
R.L. Moore, University of Arizona, School of Liberal Arts, Dept. of Astronomy, *Tucson, Arizona* 85721 (NAG 8-408)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0004, A STUDY OF THE SHORT WAVELENGTH PERFORMANCE OF A LARGE-APERTURE SPACE TELESCOPE
B.T. Soifer, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NCA 2-90101)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0005, DETECTION, IDENTIFICATION, AND PRECISE LOCATION OF INFRARED OBJECTS
C.E. Heiles, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (NCC 2-142)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

10.0006, RESEARCH INTO THE THEORY OF STELLAR STRUCTURE AND EVOLUTION
R.K. Ulrich, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California* 90024 (AST78-20236)

The structure and evolution of stars will be studied both observationally and theoretically by utilizing a variety of new diagnostic techniques. The areas of concentration will be 1) solar structure as deduced from global oscillations and solar neutrinos, 2) the evolution of pre-main sequence stars as influenced by surrounding gas, 3) the structure and evolution of interacting binary systems. Along with considerations of solar neutrinos, the diagnostic techniques rely primarily on the theory and observation of gas motions within or near the star. The study of solar structure may permit a model of the sun which is more thoroughly tested than was previously possible. The study of pre-main sequence stars should allow a more complete understanding of how the gas in a pre-stellar cloud interacts with the forming star. The study of interacting binaries should permit a better understanding of accretion disks which are postulated to exist near black holes.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0007, THE RELATION BETWEEN MAGNETIC FIELDS AND CORONAE IN LATE-TYPE STARS
S.S. Vogt, University of California, Santa Cruz Campus, Graduate School, Dept. of Astronomy & Astrophysics, *Santa Cruz, California* 95060 (NAG 8-407)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0008, ULTRAVIOLET-ENERGY DISTRIBUTION OF SELECTED GALAXIES
A. Oemler, Yale University, School of Arts & Sciences, Dept. of Astronomy, *206 Elm, New Haven, Connecticut* 06520 (NAG 5-188)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0009, OBSERVATIONAL PROGRAM IN GROUND-BASED INFRARED ASTRONOMY
E.E. Becklin, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (AST78-09513)

A television guiding system and a chopping secondary mirror modification will be installed on the eighty-eight inch telescope at Mauna Kea, Hawaii. The television guiding system and chopping secondary will be used primarily to make the use of the telescope for observations more efficient. The television system will allow accurate guiding on low surface brightness galaxies. The new chopping secondary mirror modification will increase the signal-to-noise ratio for specific infrared observations.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0010, STUDIES IN STELLAR STRUCTURE AND EVOLUTION

I. Iben, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Astronomy, *Urbana, Illinois* 61801 (AST78-20124)

This grant will provide funds for a study of the late stages of evolution of single stars, with emphasis on the evolution of stars of intermediate mass. The question of whether carbon will ignite explosively in such stars will be investigated. There will be investigations of nucleosynthesis in the shells of thermally pulsing stars. These projects will be carried to completion and several new investigations will be initiated. These investigations will include a study of the evolution of a deep interior of a star after all of the carbon at the center of the star has undergone thermonuclear reaction. There will be a study of the late stages of evolution of massive stars.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, RADIO OBSERVATIONS OF INTERSTELLAR CLOUDS, CIRCUMSTELLAR SHELLS, AND COMETS

L.E. Snyder, University of Illinois, Urbana Champaign Campus, School of Liberal Arts & Sciences, Dept. of Astronomy, *Urbana, Illinois* 61801 (AST79-07830)

The research in this project is concerned with molecules in astronomical objects. Maser emission from silicon oxide (SiO) and hydroxyl radical (OH) molecules originating in shells of material surrounding stars will be studied to learn more about the physics of the maser-pumping processes and to measure the sizes of these circumstellar shells. The SiO maser in the Orion region remains enigmatic and this research should cast light on its nature.

Observational searches for certain large molecules, including glycine, will be carried out in various regions of the interstellar medium. The positive detection of glycine, the simplest of the amino acids, will have strong implications for theories of the origins of life on the Earth and elsewhere in the universe. Observations of molecules containing deuterium, the isotope of hydrogen of mass 2, will enhance understanding of interstellar abundance ratios, chemical fractionation, and partial ionization. The observations will also enhance understanding of the fundamental molecular constants. Radio observations of molecules in comets will be made in order to advance the currently limited understanding of cometary chemistry. The ultimate goal of this research is to understand galactic chemical evolution and its role in the various stages of star formation. The observations will be made with three different radio telescopes, the 36-foot and 140-foot of the National Radio Astronomy Observation and the University of Illinois' Vermillion River Observatory's 120-foot dish.

This is a continuation of AST-7701345AO1.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0012, COORDINATED X-RAY AND OPTICAL OBSERVATIONS OF MARKARIAN-180, AND THE SEARCH FOR X-RAY EMISSION FROM S-TYPE MARKARIAN GALAXIES

S.L. Mufson, Indiana University, Bloomington Campus, School of Arts & Sciences, Dept. of Astronomy, *Memorial Hall, Bloomington, Indiana* 47401 (NAG 8-396)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
George C. Marshall Space Flight Center

10.0013, MULTIPLE GEOSYNCHRONOUS SATELLITE OBSERVATIONS OF GEOMAGNETIC PULSATIONS

W.J. Hughes, Boston University, School of Liberal Arts, Dept. of Astronomy, *755 Commonwealth Ave., Charles River Campus, Boston, Massachusetts* 02215 (ATM79-11899)

Geomagnetic pulsations, long considered an interesting phenomenon in their own right, are rapidly becoming important diagnostic tools for observing the state of the magnetosphere and solar wind. Their usefulness in this respect will be greatly enhanced by a better understanding of the mechanisms by which they are produced and by which they propagate in the magnetosphere and to the ground.

Early in this decade rapid advances in our understanding of pulsations were made by using chains of magnetometers along a line of constant longitude. These results led directly to the development of new theories of pulsation structure and the resonance of geomagnetic field lines, but an important parameter which helps distinguish between competing theories of pulsation production remained unmeasured. This parameter is the East-West wavelength of pulsations. Very recently a few measurements of East-West phase difference have been made, and both direction of propagation and East-West wave-length could be deduced. Some results fitted expectations but many did not and more work needs to be done. The research supported here will extend one of the earliest studies of East-West structure, and the only one made in space. A fortuitous grouping of three geosynchronous satellites equipped with similar magnetometers occured for three months in early 1975, and so formed a de facto East-West chain of magnetometers in space. An examination of data from six dayside passes has produced many new results. One of these is that the nightside appears to be an important source of many dayside pulsations, and this fact has been corroborated by recent results from a ground network. This grant permits a comprehensive analysis to address this question in particular. The aim is to provide insight into the major production mechanisms of geomagnetic pulsations.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0014, THEORETICAL ASTROPHYSICAL STUDIES RELATED TO SPACE ASTRONOMY

L.L. Cowie, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAGW 208)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Office of Space Science

10.0015, THEORETICAL GALACTIC DYNAMICS AND HIGH-ENERGY ASTROPHYSICS

J.P. Ostriker, Princeton University, Graduate School, Dept. of Astrophysical Sciences, *205 Nassau Hall, Princeton, New Jersey* 08540 (AST76-20255)

Theoretical research will be directed toward a number of astrophysical topics. Answers will be sought to questions such as: In what form is the dark mass which we know exists in the outer parts of galaxies? Is there any simple way that the Hubble sequence of galaxy forms can be understood as a variation of a single parameter defining the initial state of a protogalaxy? Is either the size or mass of galaxies understandable from physical principles or are these broadly distributed parameters having no preferred values? Could they be large black holes accreting diffuse gas? Can the energy (rather than momentum) absorbed by accreting gas be so large as to inhibit the accretion giving a

limit like the Eddington limit? Will turbulence in the accretion disc produce hot coronae and winds, thus invalidating the assumptions on which the standard models for X-ray sources are based? Do embedded pulsars make a significant contribution to supernova dynamics? Can the collection of galactic supernova effectively sweep out almost all of the intercloud medium producing the hot gas seen by the Copernicus satellite? The questions are a sample of those that will be considered in this research.

This is a continuation of research previously supported under NSF grant AST76-20255AO1.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0016, STUDY OF NOVA OUTBURST

G.S. Kutter, Evergreen State College, Graduate School, Dept. of Astronomy, *Olympia, Washington* 98505 (NAG 5-187)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0017, GENERAL THEORETICAL STUDIES OF STELLAR CHROMOSPHERES, CORONAE, AND TRANSITION LAYERS

B. Erika, University of Washington, School of Arts & Sciences, Dept. of Astronomy, *Seattle, Washington* 98195 (AST78-21024)

The temperature of a star generally decreases as one goes from the interior to the outer atmosphere. We know, however, that in the outer layers of the sun the temperatre increases from 5800 degrees at the base of the photosphere to 10,000 degrees in the chromosphere to 1.5 million degrees in the corona. If the only form of energy transport is through radiative processes, then such temperatures could not occur in the corona. It is clear that the chromosphere and corona of the Sun must be heated by some form of nonthermal energy like soundwaves, shockwaves, or magneto-hydrodynamic waves. The exact manner in which the solar chromosphere and corona are heated and how this heating depends on height remains uncertain.

It is now possible to observe chromospheres and coronae in other stars. Observations of different stars show large variations in radiation from these layers. The studies that will be carried-out will be aimed at determining how the temperature and pressure stratifications and the radiation from the chromosphere and transition layer depend on the heating mechanisms. This will enable one to determine how the observed differences in the observations relate to differences in chromospheric structure and heating.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0018, ULTRAVIOLET STUDIES WITH SATELLITE DATA

B.D. Savage, University of Wisconsin, Madison Campus, School of Natural Sciences, Dept. of Astronomy, *Agriculture Hall, Madison, Wisconsin* 53706 (NAG 5-186)

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Goddard Space Flight Center

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N81-31103* National Aeronautics and Space Administration, Washington, D. C.

AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 137, JULY 1981

Jul. 1981 148 p

(NASA-SP-7037(137)) Avail: NTIS HC $5.00 CSCL 01B

This bibliography lists 483 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1981. Author

N81-31104# Air Force Human Resources Lab., Brooks AFB, Tex. Logistics and Technical Training Div.

ACTUAL VERSUS SIMULATED EQUIPMENT FOR AIRCRAFT MAINTENANCE TRAINING: COST IMPLICATIONS OF THE INCREMENTAL VERSUS THE UNIQUE DEVICE

Final Report

Richard E. Vestewig and F. Thomas Eggemeier Jul. 1981 18 p refs Presented at the 23rd Ann. Meeting of the Human Factors Soc., 1979

(AF Proj. 1710)

(AD-A102388; AFHRL-TP-81-17) Avail: NTIS HC A02/MF A01 CSCL 14/1

Life cycle cost estimates were developed for use of simulated test equipment vs actual test equipment in a maintenance training program of the type used for current advanced fighter aircraft. Previous life cycle cost comparisons had not explicitly considered the cost implications of procurement and support of a unique training device vs an incremental device. This effort included the unique vs the incremental device factor. Total estimated fifteen year costs for simulated equipment trainers were significantly lower than comparable estimates for actual equipment trainers. The results indicate that the cost implications of a unique device vs an incremental device are important determinants of both acquisition and support cost estimates and should be considered fully in future life cycle costing efforts. Author (GRA)

N81-31105# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

DYNAMIC STABILITY PARAMETERS

May 1981 389 p refs Lecture Series held at Moffett Field, Calif., 2-5 Mar. 1981 and Rhode-Saint-Genese, Belgium, 16-19 Mar. 1981; sponsored in part by the von Karman Inst. for Fluid Dynamics

(AGARD-LS-114; ISBN-92-835-1385-1) Avail: NTIS HC A17/MF A01

The impact of high angle of attack aerodynamics on dynamic stability characteristics of aerospace vehicles is reviewed. Analytical, wind tunnel, and flight test techniques used are surveyed. For individual titles, see N81-31106 through N81-31123.

N81-31106*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AERODYNAMIC MATHEMATICAL MODELING - BASIC CONCEPTS **c05**

Murray Tobak and Lewis B. Schiff *In* AGARD Dyn. Stability Parameters May 1981 31 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01

The mathematical modeling of the aerodynamic response of an aircraft to arbitrary maneuvers is reviewed. Bryan's original formulation, linear aerodynamic indicial functions, and superposition are considered. These concepts are extended into the nonlinear regime. The nonlinear generalization yields a form for the aerodynamic response that can be built up from the responses to a limited number of well defined characteristic motions, reproducible in principle either in wind tunnel experiments or flow field computations. A further generalization leads to a form accommodating the discontinuous and double valued behavior characteristics of hysteresis in the steady state aerodynamic response. J.D.H.

N81-31107*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

IMPACT OF HIGH-ALPHA AERODYNAMICS ON DYNAMIC STABILITY PARAMETERS OF AIRCRAFT AND MISSILES **c02**

Gerald N. Malcolm *In* AGARD Dyn. Stability Parameters May 1981 18 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01 CSCL 01A

The aerodynamic phenomena associated with high angles of attack and their effects on the dynamic stability characteristics of airplane and missile configurations are examined. Information on dynamic effects is limited. Steady flow phenomena and their effects on the forces and moments are reviewed. The effects of asymmetric vortices and of vortex bursting on the dynamic response of flight vehicles are reviewed with respect to their influence on: (1) nonlinearity of aerodynamic coefficients with attitude, rates, and accelerations; (2) cross coupling between longitudinal and lateral directional models of motion (3) time dependence and hysteresis effects (4) configuration dependency; and (5) mathematical modeling of the aerodynamics. Author

N81-31108# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.

REVIEW OF TECHNIQUES FOR DETERMINATION OF DYNAMIC STABILITY PARAMETERS IN WIND TUNNELS **c09**

K. J. Orlik-Rueckemann *In* AGARD Dyn. Stability Parameters May 1981 28 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01

The basic principles of various methods of wind tunnel testing and the practical aspects of various techniques are discussed and illustrated by examples, descriptions, and sketches of existing apparatuses. Methods of measuring dynamic derivatives are reviewed. The measurement of reactions and of motion, rotary and half model techniques, derivatives due to translational

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acceleration and pure rotation, free model techniques, and control surface oscillation techniques are considered. J.D.H.

N81-31109# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.
DIRECT FORCED-OSCILLATION TECHNIQUES FOR THE DETERMINATION OF STABILITY DERIVATIVES IN WIND TUNNELS **c09**
E. S. Hanff *In* AGARD Dyn. Stability Parameters May 1981 23 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The current state-of-the-art in the field of stability parameters measurement in wind tunnels using the direct forced oscillation technique is discussed. The principles on which the technique is based, and some typical wind tunnel apparatuses and instrumentation systems are briefly described. A rather detailed description of the data reduction procedures used at NAE to obtain both direct as well as cross and cross-coupling derivatives is given. An advanced dynamic calibrator with which the validity of the experimental and analytical procedures can be independently verified is described. Author

N81-31110# Royal Aircraft Establishment, Bedford (England). Dept. of Aerodynamics.
WIND-TUNNEL MEASUREMENT OF AERODYNAMIC DERIVATIVES USING FLEXIBLE-STING RIGS **c09**
C. O. OLeary *In* AGARD Dyn. Stability Parameters May 1981 15 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

Forced oscillation, flexible sting rigs are used by several establishments for wind tunnel measurement of aerodynamic derivatives. This paper describes the two multi-degree of freedom rigs at RAE Bedford and DFVLR. Aircraft models are mounted on stings with built in flexures and oscillations are excited in 2 or 3 degrees of freedom. The response is measured using strain gauges on the sting flexures. Measurements of lateral or longitudinal derivatives can be made. Details are given of the apparatus, technique and method of analysis. Current modifications to the RAE rig actuating system are described and differences in the RAE and DFVLR rigs are discussed. Results are presented, from low speed high angle of attack tests on a combat aircraft model which were made with a new semicircular sting support facility which allows testing up to an angle of 90 deg. A comparison is made of the derivative data from wind tunnel tests, the corresponding data from flight tests and some theoretical estimates for two configurations: a jet trainer and a transport aircraft. Author

N81-31111*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTARY AND MAGNUS BALANCES **c09**
Gerald N. Malcolm *In* AGARD Dyn. Stability Parameters May 1981 26 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

Two wind tunnel techniques for determining part of the aerodynamic information required to describe the dynamic behavior of various types of vehicles in flight are described. Force and moment measurements are determined with a rotary-balance apparatus in a coning motion and with a Magnus balance in a high-speed spinning motion. Coning motion is pertinent to both aircraft and missiles, and spinning is important for spin stabilized missiles. Basic principles of both techniques are described, and specific examples of each type of apparatus are presented. Typical experimental results are also discussed. Author

N81-31112*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CURVED-FLOW, ROLLING-FLOW, AND OSCILLATORY PURE-YAWING WIND-TUNNEL TEST METHODS FOR DETERMINATION OF DYNAMIC STABILITY DERIVATIVES **c02**
Joseph R. Chambers, Sue B. Grafton, and Frederick H. Lutze (Virginia Polytechnic Inst. and State Univ.) *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

The test capabilities of the Stability Wind Tunnel of the Virginia Polytechnic Institute and State University are described, and calibrations for curved and rolling flow techniques are given. Oscillatory snaking tests to determine pure yawing derivatives are considered. Representative aerodynamic data obtained for a current fighter configuration using the curved and rolling flow techniques are presented. The application of dynamic derivatives obtained in such tests to the analysis of airplane motions in general, and to high angle of attack flight conditions in particular, is discussed. J.D.H.

N81-31113# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SUPPORT INTERFERENCE **c09**
L. E. Ericsson *In* AGARD Dyn. Stability Parameters May 1981 26 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The existing information about support interference is reviewed, with particular emphasis on dynamic interference effects and the special problems encountered at high angles of attack. Support interference effects are much more severe in dynamic than in static tests. The support interference is aggravated by a boat-tail or dome shaped base, or even by modest base shoulder roundness. The general conclusion is that asymmetric stings or sting-strut combinations should be avoided. For slender bodies at low angles of attack a transverse rod comes close to permitting the true dynamically destabilizing effect of a bulbous base to be measured whereas even a very slender sting will distort the near wake effect and produce an unconservatively high measure of the dynamic stability. At intermediate and high angles of attack the sting support is superior to the other support methods. In many cases half-model testing provides the means of avoiding most of the support interference effects. In some cases, as for a short blunt body such as the Viking configuration, the best approach appears to be to allow sting plunging, using a very slender sting. J.D.H.

N81-31114# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamic Lab.
APPLICATIONS OF HALF-MODEL TECHNIQUE IN DYNAMIC STABILITY TESTING **c02**
E. S. Hanff *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The applications of the half model technique to oscillatory wind tunnel experiments are considered. The practical advantages and disadvantages of using the half model technique for dynamic stability testing are briefly stated and compared with those of its full model counterpart. Examples are given of various wind-tunnel dynamic experiments for which the half model technique is particularly suitable. Descriptions of pitching, plunging and dynamic calibrating apparatuses are given as well as a brief review of the data analysis required for the determination of direct derivatives using the free and forced oscillation technique. Methods of obtaining cross derivatives in the longitudinal plane are also indicated. J.D.H.

N81-31115# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
DETERMINATION OF AIRCRAFT DYNAMIC STABILITY AND CONTROL PARAMETERS FROM FLIGHT TESTING **c05**
P. G. Hamel *In* AGARD Dyn. Stability Parameters May 1981 42 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The present state of the art of aircraft parameter identification (PI) techniques from flight test data and appraisal of current methods developed and applied to various aircraft configurations and flight conditions are reviewed. Practical aspects and results of PI techniques are emphasized. This is especially relevant for data correlation and for increasing confidence in static and dynamic wind tunnel prediction techniques. Recent experience for fixed and rotary wing aircraft PI are presented as well as identification results for extreme flight regimes. Information on pilot in the loop and closed loop aspects of aircraft PI are given with special reference to the interrelationship between stability and controllability. The application potential and experience of PI methods for dynamic wind tunnel testing and requirements necessary for gaining more insight and confidence in using static

and dynamic wind tunnel data for flight/ground testing corelation are discussed. E.A.K.

N81-31116*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF DYNAMIC STABILITY PARAMETERS FROM DROP MODEL FLIGHT TESTS **c08**
Joseph R. Chambers and Kenneth W. Iliff (NASA. Hugh L. Dryden Flight Research Center) *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

The overall remotely piloted drop model operation, descriptions, instrumentation, launch and recovery operations, piloting concept, and parameter identification methods are discussed. Static and dynamic stability derivatives were obtained for an angle attack range from -20 deg to 53 deg. It is indicated that the variations of the estimates with angle of attack are consistent for most of the static derivatives, and the effects of configuration modifications to the model were apparent in the static derivative estimates. E.A.K.

N81-31117# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ANALYTICAL DETERMINATION OF DYNAMIC STABILITY PARAMETERS **c08**
C. P. Schneider *In* AGARD Dyn. Stability Parameters May 1981 40 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The design of modern missiles for military use is characterized by compromises between flight stability and high maneuverability is discussed. High maneuverability yet stable flight performance requires secure missile control at high angles of attack and yaw, with possibly rapid changes of these angles and of the roll angle, and with coupled motions. The aerodynamic derivatives needed for performance predictions result from complex solutions of nonlinear and unsteady or quasisteady relations. Derivatives of longitudinal stability are discussed. For subsonic flow conditions, the derivatives of the missile components, are investigated at high angles of attack. The scope of performances of modern missiles includes high angle of attack maneuverability in supersonic flight. A prediction method based on the theory of indicial functions is outlined for slender wings. Possibilities of obtaining the stability derivatives of bodies at high angle of attack in supersonic flight are discussed. The application of solution methods using finite elements or paneling is presented. E.A.K.

N81-31118# Lockheed Missiles and Space Co., Sunnyvale, Calif.
AEROELASTICITY, INCLUDING DYNAMIC EFFECTS OF SEPARATED FLOW **c02**
L. E. Ericsson *In* AGARD Dyn. Stability Parameters May 1981 27 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

Static experimental data used to define the unsteady aerodynamics of separated flow, and how these are used to define the dynamic structural response are described. The static aeroelastic response and the structural divergence, are determined by using experimental results directly. However, this is not the case regarding the dynamic response of the structure. By using the static experimental data in pseudostatic analysis theory, the aerodynamic damping of an elastic vehicle including the often dominating effects of separated flow can be computed. The method was applied to predict the aeroelastic characteristics of the Saturn-Apollo and space shuttle launch vehicles. E.A.K.

N81-31119# Royal Aircraft Establishment, Farnborough (England).
CONTROL DERIVATIVES **c08**
A. Jean Ross *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

Two groups of dynamic parameters associated with control surfaces are discussed. The first group consists of the hinge moments which determine the dynamic response of the control surface to the control demand. The second group consists of the control derivatives which influence the dynamic response of the aircraft. The dynamic stability parameters of the aircraft with control system are dependent on the control characteristics, and examples are given to illustrate both this dependence and the typical variations of control derivatives with angle of attack and Mach number. Selected results for conventional control surfaces (flaps, elevator, aileron and rudder) and for other controls of current interest (horizontal and vertical canards and vectored thrust) are included. E.A.K.

N81-31120# National Aeronautical Establishment, Ottawa (Ontario).
SENSITIVITY OF AIRCRAFT MOTION TO CROSS COUPLING AND ACCELERATION DERIVATIVES **c05**
K. J. Orlik-Rueckemann *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

Modern military aircraft are often designed to maneuver at relatively high angles of attack and therefore are subjected to conditions where the flow becomes highly asymmetric. They are sometimes equipped with direct lift or direct sideforce controls and therefore able to perform translational as well as the traditional rotational maneuvers. Under such flight conditions and maneuvers, certain derivatives that are negligible under symmetric, low angle of attack flight conditions may become large enough to be significant. These include certain static and dynamic cross coupling derivatives and derivatives due to translational acceleration. Most derivatives usually display strong nonlinearities at high angles of attack. E.A.K.

N81-31121*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME APPLICATIONS OF AERODYNAMIC FORMULATIONS TO PROBLEMS IN AIRCRAFT DYNAMICS **c05**
Lewis B. Schiff and Murray Tobak *In* AGARD Dyn. Stability Parameters May 1981 15 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

Two applications of mathematical modeling to aerodynamic problems are cussed. The first application is an investigation of the capacity of a nonlinear aerodynamic mathematical model to describe the aerodynamic reactions on an airfoil with a deflecting flap in transonic flow. Flow field computational methods are used to evaluate the nonlinear, unsteady aerodynamic data in terms of characteristic motions called for by the model. Histories of unconstrained motions of the flap are generated from the flap equations of motion, with the aerodynamic reactions specified by the mathematical model. In the second application wing rock is investigated. The most recent model accommodates experimental results wing rock by admitting the existence of aerodynamic hysteresis in the variation of the steady state rolling moment coefficient with roll angle is described. E.A.K.

N81-31122*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATIONS OF DYNAMIC STABILITY PARAMETERS TO PROBLEMS IN AIRCRAFT DYNAMICS **c35**
Joseph R. Chambers, Daniel J. DiCarlo, and Joseph L. Johnson, Jr. *In* AGARD Dyn. Stability Parameters May 1981 12 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

The application and analysis of dynamic stability parameters were examined. The effects of wing leading edge modifications on the stalling and spinning characteristics of a single engine general aviation research airplane are evaluated. It is illustrated how dynamic stability parameters measured in wind tunnel tests are used to predict the spin resistance of this class of aircraft, and that autorotation criteria are derived from the relationships which exist between static and dynamic aerodynamic characteristics. E.A.K.

N81-31123# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
APPLICATION TO MISSILE DYNAMICS **c15**
C. P. Schneider *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

The connection between aerodynamic modelling and the equations of motion is explained. Simple missile motions are chosen to explain steady and dynamic stability. The influence of

steady and dynamic (quasisteady) derivatives is estimated. Examples for the simulation of complicated flight motions caused by nonlinear unsteady forces and moments are selected and shown in diagrams. E.A.K.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N81-31124*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PRELIMINARY RESULTS OF BUFFET TESTS IN A CRYOGENIC WIND TUNNEL

Richmond P. Boyden and William G. Johnson, Jr. Jul. 1981 38 p refs

(NASA-TM-81923) Avail: NTIS HC A03/MF A01 CSCL 01A

Buffet tests of two wings with different leading-edge sweep show that it is feasible to use the standards wing root bending moment technique in a cryogenic wing tunnel. The results for the 65 deg sweep delta wing indicate the importance of matching the reduced frequency parameter in model tests for planforms which are sensitive to reduced frequency parameter if quantitative buffet measurements are required. The unique ability of a pressurized cryogenic wind tunnel to separate the effects of Reynolds number and of aeroelastic distortion by variations in the tunnel stagnation temperature and pressure was demonstrated. T.M.

N81-31125*# Mississippi State Univ., State College. Engineering and Industrial Research Station.

PROPELLER PROPULSION INTEGRATION, PHASE 2 Final Report

Keith Koenig, Phil Bridges, and A. George Bennett Sep. 1981 16 p

(Grant NAG3-56)

(NASA-CR-164730; MSSU-EIRS-ASE-81-5) Avail: NTIS HC A02/MF A01 CSCL 01A

Progress in the development of test bodies and analytical prediction techniques for the study of propeller propulsion integration is summarized. In the experimental phase, two bluff afterbodies were constructed for full scale testing. The analytical effort centered on bringing two potential flow computer programs up to an operational level. The afterbodies are briefly described and the capabilities of the computer programs are discussed. E.A.K.

N81-31126*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STALL FLUTTER EXPERIMENT IN A TRANSONIC OSCILLATING LINEAR CASCADE

Donald R. Boldman, Alvin E. Buggele, and George M. Michalson 1981 19 p refs Presented at Winter Ann. Meeting of the Am. Soc. of Mech. Engr., Washington, D.C., 15-20 Nov. 1981 (NASA-TM-82655; E-918) Avail: NTIS HC A02/MF A01 CSCL 01A

Two dimensional biconvex airfoils were oscillated at reduced frequencies up to 0.5 based on semi-chord and a free stream Mach number of 0.80 to simulate transonic stall flutter in rotors. Steady-state periodicity was confirmed through end-wall pressure measurements, exit flow traverses, and flow visualization. The initial flow visualization results from flutter tests indicated that the oscillating shock on the airfoils lagged the airfoil motion by as much as 80 deg. These initial data exhibited an appreciable amount of scatter; however, a linear fit of the results indicated that the greatest shock phase lag occurred at a positive interblade phase angle. Photographs of the steady-state and unsteady flow fields reveal some of the features of the lambda shock wave on the suction surface of the airfoils. T.M.

N81-31127*# Analytical Methods, Inc., Bellevue, Wash.

DEVELOPMENT OF THE TRIPLET SINGULARITY FOR THE ANALYSIS OF WINGS AND BODIES IN SUPERSONIC FLOW Final Report

Frank A. Woodward Sep. 1981 73 p refs

(Contract NAS1-15792)

(NASA-CR-3466; AMI-8104) Avail: NTIS HC A04/MF A01 CSCL 01A

A supersonic triplet singularity was developed which eliminates internal waves generated by panels having supersonic edges. The triplet is a linear combination of source and vortex distributions which gives directional properties to the perturbation flow field surrounding the panel. The theoretical development of the triplet singularity is described together with its application to the calculation of surface pressures on wings and bodies. Examples are presented comparing the results of the new method with other supersonic methods and with experimental data. Author

N81-31128*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GRID3D: COMPUTER PROGRAM FOR FAST GENERATION OF MULTILEVEL, THREE-DIMENSIONAL BOUNDARY-CONFORMING O-TYPE COMPUTATIONAL GRIDS

Djordje S. Dulikravich Sep. 1981 14 p refs

(NASA-TP-1920; E-590) Avail: NTIS HC A02/MF A01 CSCL 01A

A fast algorithm was developed for accurately generating boundary-conforming, three-dimensional, consecutively refined computational grids applicable to arbitrary wing-body and axial turbomachinery geometries. The method is based on using an analytic function to generate two-dimensional grids on a number of coaxial axisymmetric surfaces positioned between the centerbody and the outer radial boundary. These grids are of the O-type and are characterized by quasi-orthogonality, geometric periodicity, and an adequate resolution throughout the flow field. Because the built-in nonorthogonal coordinate stretching and shearing cause the grid lines leaving the blade or wing trailing edge to end at downstream infinity, the numerical treatment of the three-dimensional trailing vortex sheets is simplified. Author

N81-31129*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURROGATE-EQUATION TECHNIQUE FOR SIMULATION OF STEADY INVISCID FLOW Final Report

Gary M. Johnson Washington NASA Sep. 1981 40 p refs (NASA-TP-1866; E-583) Avail: NTIS HC A03/MF A01 CSCL 01A

A numerical procedure for the iterative solution of inviscid flow problems is described, and its utility for the calculation of steady subsonic and transonic flow fields is demonstrated. Application of the surrogate equation technique defined herein allows the formulation of stable, fully conservative, type dependent finite difference equations for use in obtaining numerical solutions to systems of first order partial differential equations, such as the steady state Euler equations. Steady, two dimensional solutions to the Euler equations for both subsonic, rotational flow and supersonic flow and to the small disturbance equations for transonic flow are presented. Author

N81-31130*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HIGH REYNOLDS NUMBER RESEARCH - 1980

L. Wayne McKinney, ed. and Donald D. Baals, ed. (Joint Inst. for Advancement of Flight Sciences, Hampton, Va.) Sep. 1981 315 p refs Workshop held at Hampton, Va., 9-11 Dec. 1980 (NASA-CP-2183; L-14416) Avail: NTIS HC A14/MF A01 CSCL 01A

The fundamental aerodynamic questions for which high Reynolds number experimental capability is required were examined. Potential experiments which maximize the research returns from the use of the National Transonic Facility (NTF) were outlined. Calibration plans were reviewed and the following topics were discussed: fluid dynamics; high lit; configuration aerodynamics; aeroelasticity and unsteady aerodynamics; wind tunnel/flight correlation; space vehicles; and theoretical aerodynamics For individual titles, see N81-31131 through N81-31152.

N81-31131*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE NATIONAL TRANSONIC FACILITY: REVIEW AND STATUS REPORT **c09**
Robert R. Howell *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 1-24 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The status of the National Transonic Facility (NTF) Project and some of the pertinent performance characteristics and features of the new wind tunnel are reviewed. The liquid nitrogen supply, current views of user cost, and the activation schedule are discussed. E.A.K.

N81-31132*# National Aeronautics and Space Administration, Washington, D. C.
THE NTF AS A NATIONAL FACILITY **c09**
Clinton E. Brown *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 25-28 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The future evolution of the NTF as a national facility was discussed. The aerodynamic test facility is charged with maintaining the test data and operating the facility with maximum productivity to increase the utility as well as to minimize the test costs. Efforts are under way to increase productivity of the wind tunnels. The future developments needed include: (1) the elimination of wall interference uncertainties; (2) the elimination of minimization of sting interference; and (3) the achievement of free air quality low turbulence airflow. Research in the wall interference area, smart walls, is reported. E.A.K.

N81-31133*# Office of the Under Secretary of Defense for Research and Engineering, Washington, D. C.
NTF AND THE DEPARTMENT OF DEFENSE **c09**
Raymond F. Siewert *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 29-30 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The relationship of the National Transonic Facility (NTF) to the Department of Defense (DOD) is discussed. Recognition of the need for the NTF capabilities were first encountered in military aircraft development. Several tactical aircrafts experienced the after body drag which was higher than predicted by small scale tests, resulting in less than desired transonic acceleration performance. It is necessary to understand the problem because flight efficiency is more important for military aircrafts. Improved cruise performance is required for the whole range of military mission. Factors that make cruise efficiency important include: (1) rapid deployment airlift capability; (2) self-deployment capability for tactical aircraft; (3) reduced tanker dependence for strategic aircraft. It is concluded that the continuing escalating cost of fuel mandates to develop aircraft that are as fuel efficient as possible. Other uses for NTF are outlined. E.A.K.

N81-31134*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NTF MANAGEMENT CONSIDERATIONS **c09**
Robert E. Bower *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 31-36 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The National Transonic Facility (NTF) was designed to be a national testing facility satisfying the research and development needs of NASA, DOD, industry, and universities. The NTF offers simulation of full scale Reynolds numbers in the critical flight regions of most current and planned aerospace vehicles. The degree of interest by users will depend greatly upon tunnel productivity, data quality, and cost. E.A.K.

N81-31135*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PATHFINDER MODEL PROGRAM FOR THE NATIONAL TRANSONIC FACILITY
Clarence P. Young, Jr. *In its* High Reynolds Number Res. 1980 Sep. 1981 p 37-52 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

An overview of the Pathfinder Models Program is presented. The Pathfinder program is a major research and development activity in support of the National Transonic Facility Activation Plan. The program scope, models design approach, and Pathfinder model configurations are presented along with a discussion of major supportive program activities. The anticipated design criteria for NTF models are presented. E.A.K.

N81-31136*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODEL EXPERIENCE IN THE LANGLEY 0.3-M TRANSONIC CRYOGENIC TUNNEL
Pierce L. Lawing and Robert A. Kilgore *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 53-73 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

The model building, development, and testing experience gained during 8 years of operation of the 0.3-m Transonic Cryogenic Tunnel (TCT) is summarized. The summary is divided into four portions: (1) models tested in the 0.3-m TCT's original octagonal test section; (2) models tested in the present two dimensional test section; (3) models tested as a part of tunnel calibration and the development of advanced technology airfoils; and (4) development of a new way to construct two dimensional airfoil models. Design requirements imposed on the models by high Reynolds number testing at cryogenic temperatures are reviewed. E.A.K.

N81-31137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION SYSTEMS FOR THE NATIONAL TRANSONIC FACILITY **c09**
Joseph F. Guarino *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 75-80 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

Instrumentation and measurement systems designs to achieve high Reynolds number test are discussed. The national transonic tunnel with its unique operational characterisics is a complex facility and represents a significant challenge to wind tunnel instrument designers. The instrument requirements imposed by the new testing environment, the instrument systems provided for facility calibration and operation, and the research and development activities directed at meeting overall instrument and measurement requirements are described. E.A.K.

N81-31138*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION FOR CALIBRATION AND CONTROL OF A CONTINUOUS-FLOW CRYOGENIC TUNNEL **c09**
Charles L. Ladson and Robert A. Kilgore *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 81-91 refs Presented at the AGARD-VKI Lecture Series 3 on Cryogenic Wind Tunnels, Rhode-Saint-Genese, Belgium, 19-23 May 1980 and Hampton, Va., 27-30 May 1980 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

Aspects of selection and application of calibration and control instrumentation that are influenced by the extremes in the temperature environment to be found in cryogenic tunnels are described. The instrumentation and data acquisition system used in the 0.3-m transonic cryogenic tunnel along with typical calibration data obtained in a 20 by 60 cm two dimensional test section are described. E.A.K.

N81-31139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ONSET OF CONDENSATION EFFECTS IN CRYOGENIC WIND TUNNELS **c09**
Robert M. Hall *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 93-104 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The onset of condensation effects in cryogenic wind tunnels which limits their minimum operating temperatures is examined. If this onset of effects occurs below saturation temperature, then the tunnels may be operated at the lower temperatures and additional benefits to cryogenic tunnel operation resulting in increased Reynolds number capability and reduced operating costs. Both homogeneous and heterogeneous nucleation processes

are discussed as they pertain to continuous flow cryogenic wind tunnels. Examples from condensation experiments in the 0.3 m Transonic Cryogenic Tunnel are also reviewed. E.A.K.

N81-31140*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW QUALITY MEASUREMENTS IN TRANSONIC WIND TUNNELS AND PLANNED CALIBRATION OF THE NATIONAL TRANSONIC FACILITY c09
P. Calvin Stainback and Dennis E. Fuller *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 105-121 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

The need for mean flow and dynamic flow quality measurements for the National Transonic Facility (NTF) was considered. Past experience in making flow quality measurements in transonic flows and at cryogenic temperatures was used to guide the selection of methods to be used in the NTF. It appears that suitable instrumentation will be available and adequate experience has been obtained to insure that the proper calibration of the NTF can be made. E.A.K.

N81-31141*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WALL INTERFERENCE EFFECTS: STATUS REVIEW
P. A. Newman and W. B. Kemp, Jr. *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 123-241 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

The interference technology incorporated into the NTF design (hardware) and the emerging transonic wall interference assessment correction procedures (software) to be employed when the NTF becomes operational was reviewed. It is anticipated that the early experiments will provide data relevant to wall interference effects. E.A.K

N81-31142*# Boeing Commercial Airplane Co., Seattle, Wash.
COMMENTS ON REYNOLDS NUMBER EFFECTS AND THE ROLE OF NTF IN THE DEVELOPMENT OF AIR VEHICLES
A. L. Nagel *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 143-148 ref (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

The National Transonic Facility (NTF) capability to match the full scale Reynolds numbers of all but the largest airplanes is discussed. Conversion factors to enable calculation of SI-unit equivalents for all U.S. units are listed. Using data from several facilities, analytic methods, and flight test data, a competitive aircraft in the relatively low Reynolds number was developed. The NTF offers the capability to obtain data at full scale Reynolds numbers in the cruise condition for most of the products, and will be much closer than previous tunnels to full scale Reynolds number for the operating envelopes. It is primarily on the operating envelope that Reynolds number effects are most important and least predictable. E.A.K.

N81-31143*# Rockwell International Corp., Los Angeles, Calif.
AIRCRAFT DESIGN USING THE NATIONAL TRANSONIC FACILITY c05
E. Bonner *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 149-152 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01C

The utility of the cryogenic high Reynolds number test facility as a production tunnel is evaluated. Aerodynamic performance evaluation, numerical wing design verification, and high Reynolds number theoretical extensions are considered. A priority ranking of NTF uses from an airframe development viewpoint is presented. J.D.H.

N81-31144*# Rockwell International Corp., Los Angeles, Calif.
PROPOSED AEROELASTIC AND FLUTTER TESTS FOR THE NATIONAL TRANSONIC FACILITY
J. R. Stevenson *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 153-161 (For primary document see N81-31130 22-02)
Avail: NTIS HC A02/MF A01 CSCL 01A

Tests that can exploit the capability of the NTF and the transonic cryogenic tunnel, or lead to improvements that could enhance testing in the NTF are discussed. Shock induced oscillation, supersonic single degree control surface flutter, and transonic flutter speed as a function of the Reynolds number are considered. Honeycombs versus screens to smooth the tunnel flow and a rapid tunnel dynamic pressure reducer are recommended to improve tunnel performance. J.D.H.

N81-31145*# Douglas Aircraft Co., Inc., Long Beach, Calif.
Wind Tunnel Test and Development.
PRELIMINARY USER PLANNING FOR THE NASA NATIONAL TRANSONIC FACILITY c09
J. D. Cadwell *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 163-167 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

Anticipated uses for correlation testing, research and development testing, and configuration development are described. The investigation of high and low speed aerodynamics and the types of data desired from tunnel tests are discussed. J.D.H.

N81-31146*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT OF THE PANEL ON FLUID DYNAMICS c34
Percy J. Bobbitt *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 169-195 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 20D

Areas of investigation in fluid dynamics, recommended experiments, and use of the facility for theory evaluation are discussed. Tunnel flow quality and calibration of the NTF are considered. Recent technological advances affecting tunnel design are surveyed. J.D.H.

N81-31147*# National Aeronautics and Space Administration Langley Research Center, Hampton, Va
HIGH LIFT TECHNOLOGY
Paul L. Coe, Jr. and Richard J. Margason *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 197-213 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

The NASA Langley high lift technology program is reviewed and elements of the program which are considered Reynolds number sensitive are discussed. The Energy Efficient Transport (EET) and Supersonic Cruise Research (SCR) models proposed for high lift studies in the National Transonic Facility (NTF) are described. Recommendations regarding the NTF facility and test techniques are presented. Author

N81-31148*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONFIGURATION AERODYNAMICS
Edward C. Polhamus and Blair B. Gloss *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 217-234 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

Static aerodynamic research related to aircraft configurations in their cruise or combat modes is discussed. Subsonic transport aircraft, transonic tactical aircraft, and slender wing aircraft are considered. The status and plans of Langley's NTF configuration research program are reviewed. Recommendations for near term configuration research are made. J.D.H.

N81-31149*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT OF THE PANEL ON AEROELASTICITY AND UNSTEADY AERODYNAMICS
Perry W. Hanson *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 237-246 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

The status of recommended areas of study for the NTF are reviewed. Transonic and control surface unsteady aerodynamics, and buffet onset and loads are considered. Testing of dynamically scaled flutter models is discussed. J.D.H.

N81-31150*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

REPORT OF THE WIND TUNNEL/FLIGHT CORRELATION PANEL

Theodore G. Ayers *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 249-262 ref (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

Basic calibration of the tunnel prior to conducting any tests, the areas requiring wind tunnel/flight test correlation for validating the NTF, and recommendations for achieving validation of the NTF are discussed. J.D.H.

N81-31151*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HIGH REYNOLDS NUMBER RESEARCH REQUIREMENTS FOR SPACE VEHICLE DESIGN

Delma C. Freeman, Jr. *In its* High Reynolds Number Res. 1980 Sep. 1981 p 265-274 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

Requirements of entry vehicle design requiring high Reynolds number wind tunnel testing are discussed. The space shuttle orbiter, development of future space transportation systems, and planetary entry data analysis are considered. J.D.H.

N81-31152*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

REPORT OF THE PANEL ON THEORETICAL AERODYNAMICS

Jerry C. South, Jr. and Frank C. Thames *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 277-286 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01A

Interactions between theoretical aerodynamics and the NTF are discussed. The development and validation of computational fluid dynamics computer codes, the determination of Reynolds number scaling laws, and extension of the data bases of entrainment type turbulence models to include high Reynolds number data are recommended areas of study. The major benefit theoretical aerodynamics could have on the NTF is in the quantitative description of wind tunnel wall interference effects. J.D.H.

N81-31153# McDonnell-Douglas Research Labs., St. Louis, Mo.

THREE-DIMENSIONAL TRANSONIC FLOW ANALYSIS Final Scientific Report, 1 May 1976 - 30 Jun. 1980

Gerald E. Chmielewski and Frank W. Spaid 30 Jun. 1980 97 p refs
(Contract F44620-76-C-0096; AF Proj. 2307)
(AD-A101944; MDC-Q0722; AFOSR-81-0572TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

A computer program was written to calculate the steady, inviscid, transonic flow about an unyawed wing/body configuration. The code is based on the nonconservative form of the full potential equation formulated in global, wing-adapted coordinates that are not surface-conforming. Numerical solution of the governing equations is accomplished via application of type-dependent, rotated finite-difference operators and the method of line relaxation. Exact wing/body surface conditions are enforced by an imaging scheme that involves both surface control points and surface-adjacent computation points. Coordinate stretching permits far-field boundary conditions to be treated exactly; an embedded relaxation scheme computes the downwash field in the Trefftz plane. Present geometric capability includes a quite general wing attached at mid-height to a blunt-nosed, semi-infinite cylinder of varying crossplane radius. Representative solutions computed on a grid of moderate density are presented for a checkout configuration that includes ONERA Wing M6; comparisons with wing-alone experimental data are shown also. Code limitations and modifications required to further develop the program are discussed. A code listing and a user's guide summary are provided. Author (GRA)

N81-31154# Nielsen Engineering and Research, Inc., Mountain View, Calif.

BASIC STUDIES OF BODY VORTICES AT HIGH ANGLES OF ATTACK AND SUPERSONIC SPEEDS Final Report, 1 Jun. 1979 - 31 May 1980

Goetz H. Klopfer and Jack N. Nielsen Oct. 1980 88 p refs
(Contract N00014-78-C-0490; RR0141104)
(AD-A102241; NEAR-TR-226) Avail: NTIS HC A05/MF A01 CSCL 20/4

The problem of computing the steady inviscid supersonic flows about tangent ogive cylinders at high angles of attack with symmetric body vortices is solved in this report. To obtain an efficient procedure the steady Euler equations are used as the basic governing equations as opposed to the more complicated Navier-Stokes equation, the viscous effects, important near the separation line, are simulated by a Kutta condition. The rest of the flow field is essentially controlled by the inviscid equations. The equations, written in conservation form in generalized curvilinear coordinates, are approximated by MacCormack's second-order accurate predictor-corrector algorithm. The flow tangency conditions at the body surface are satisfied by Abbett's scheme and the outer bow-shock position by the Rankine-Hugoniot jump relations. Internal shock waves or tangentially discontinuities are captured. GRA

N81-31155# Dayton Univ., Ohio. Research Inst.

FAR FIELD CONDITIONS IN STEADY FLOWS WITH A FREE STREAM MACH NUMBER ONE Interim Technical Report, Apr. - Nov. 1980

Karl G. Guderley Jun. 1981 72 p refs
(Grant AF-AFOSR-3542-78; AF Proj. 2304)
(AD-A102174; UDR-TR-78-3524; AFWAL-TR-81-3064) Avail: NTIS HC A04/MF A01 CSCL 20/4

The far field in a steady flow with a free stream Mach number one is governed by the potential equation simplified by the assumption that the deviations from a sonic parallel flow are small. In a suitable system of coordinates the dominant expression has the form of a similarity solution. To formulate far field conditions (conditions imposed by far field to the computed part of the flow field at its outer edge) one considers perturbations to the dominant part of the distant field. The particular solutions of the linear partial differential equation so obtained have also similarity form. The far field conditions express the requirement that only such perturbations are admitted which die out more quickly than the basic flow as one moves toward infinity. The derivation uses a Laplace form technique; the absence of nonadmissible particular solutions expresses itself by the absence of certain poles of the Laplace transform. These conditions are ultimately formulated in terms of quantities available in the physical plane. One obtains integrals extended over the outer contour of the computed flow field which contain the potential and its gradient. Author (GRA)

N81-31156# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

COMPARISON OF HOT AND COLD SUBSONIC JETS IN EXTERNAL FLOW WITH REFERENCE TO JET ENGINE SIMULATION

W. B. deWolf and B. Munniksma 16 May 1980 49 p refs
(NLR-TR-80042-U) Avail: NTIS HC A03/MF A01

The effect of jet heating and external flow on the mean flow properties of a subsonic jet was studied. A 60 mm diameter jet was tested in a wind tunnel at wind speeds of 0 and 60 m/sec. Jet Mach numbers varied between 0.44 and 0.94 and jet total temperatures were 310 and 860 K. Velocity and temperature profiles in the jet were determined for up to 20 nozzle diameters downstream. Jet Reynolds numbers based on nozzle diameter were larger than 400,000 which is considered high enough to obtain results which are independent of Reynolds number. Semiempirical relations were obtained for the center line velocity decay, the location of the jet boundary and the direction of the streamlines at the jet boundary. From these relations the shortcomings of simulation of a hot engine exhaust jet by a cold air jet in wind tunnel experiments can be estimated. Author (ESA)

N81-31157# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.

EVALUATION OF TING'S METHOD FOR THE CALCULATION OF THE LIFT DISTRIBUTION ON A WING IN PROPULSIVE JETS

R. A. Maarsingh Nov. 1979 71 p refs
(Contract NIVR-1768)
(NLR-TR-80078-U) Avail: NTIS HC A04/MF A01

An adaptation of Ting's method was compared with wind tunnel test data. The nonlinear wing-in-jet problem was made tractable by treating the more complicated flow phenomena (nonuniformity and large disturbances) under the assumption of two dimensional flow, while the remaining, three dimensional effects are reduced to a relatively simple correction to the flow direction in planes perpendicular to the span. The half model wing had a rectangular planform, an 11% thick Clark Y profile and an aspect ratio of eight. Identical model nacelles generated two propulsive jets of 0.2 m dia. with uniform parallel velocity. Some data were taken with the wing outside a single jet. Very satisfactory results were found for the unflapped wing lying centrally within the jets. Both flap deflection and eccentricity cause the prediction of the jet-induced lift change to deteriorate. Discrepancies in applications to wing-outside-jet configurations were found. Author (ESA)

N81-31158# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

UNSTEADY AIRLOADS ON OSCILLATING WINGS IN POST-STALL CONDITION

Peter Bublitz Apr. 1981 35 p refs
(DFVLR-FB-81-16) Avail: NTIS HC A03/MF A01

Wind tunnel tests were performed on two wing configurations; a basic trapezoidal half-wing model and the same basic wing equipped with a strake. The tests were executed under incompressible flow conditions in a low-speed wind tunnel at a mach number less than 0.2 and a maximum Reynolds number of 2,000,000. The steady mean angles of attack covered the range 0 to 40 deg. The wings could be excited to forced oscillations with angular amplitudes up to 4 deg and in the frequency range 0 to 12 Hz corresponding to a range of reduced frequencies $0 < \text{omega}^* < 0.9$. The steady mean pressures are found to be strongly dependent on the geometry of the wing as well as on the angle of attack. The dependence on the latter is quite nonlinear as a consequence of the complex vortex systems. The unsteady pressure fluctuations due to the flow separation from the stationary wing can be explained rather well by means of the steady mean pressure distributions. At very high incidence the possibility of periodic vortex shedding can be shown. From coherence functions it becomes evident that the correlation lengths in the chordwise direction are considerable. Author (ESA)

N81-31107*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

IMPACT OF HIGH-ALPHA AERODYNAMICS ON DYNAMIC STABILITY PARAMETERS OF AIRCRAFT AND MISSILES

Gerald N. Malcolm *In* AGARD Dyn. Stability Parameters May 1981 18 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

N81-31112*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CURVED-FLOW, ROLLING-FLOW, AND OSCILLATORY PURE-YAWING WIND-TUNNEL TEST METHODS FOR DETERMINATION OF DYNAMIC STABILITY DERIVATIVES

Joseph R. Chambers, Sue B. Grafton, and Frederick H. Lutze (Virginia Polytechnic Inst. and State Univ.) *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

N81-31114# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamic Lab.

APPLICATIONS OF HALF-MODEL TECHNIQUE IN DYNAMIC STABILITY TESTING

E. S. Hanff *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31118# Lockheed Missiles and Space Co., Sunnyvale, Calif.

AEROELASTICITY, INCLUDING DYNAMIC EFFECTS OF SEPARATED FLOW

L. E. Ericsson *In* AGARD Dyn. Stability Parameters May 1981 27 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N81-31159*# Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.

MINIMUM NOISE IMPACT AIRCRAFT TRAJECTORIES Final Report

Ira D. Jacobson and R. G. Melton Sep. 1981 206 p refs
(Grant NsG-1509)
(NASA-CR-164719; UVA/528166/MAE81/101) Avail: NTIS HC A10/MF A01 CSCL 01C

Numerical optimization is used to compute the optimum flight paths, based upon a parametric form that implicitly includes some of the problem restrictions. The other constraints are formulated as penalties in the cost function. Various aircraft on multiple trajectores (landing and takeoff) can be considered. The modular design employed allows for the substitution of alternate models of the population distribution, aircraft noise, flight paths, and annoyance, or for the addition of other features (e.g., fuel consumption) in the cost function. A reduction in the required amount of searching over local minima was achieved through use of the presence of statistical lateral dispersion in the flight paths. T.M.

N81-31160*# Massachusetts Inst. of Tech., Cambridge. Flight Transportation Lab.

PREDICTING THE IMPACTS OF NEW TECHNOLOGY AIRCRAFT ON INTERNATIONAL AIR TRANSPORTATION DEMAND

Raymond A. Ausrotas Hampton, Va. NASA. Langley Research Center Jan. 1981 52 p refs
(Contract NAS1-15268)
(NASA-CR-165654; FTL-R80-11) Avail: NTIS HC A04/MF A01 CSCL 01C

International air transportation to and from the United States was analyzed. Long term and short term effects and causes of travel are described. The applicability of econometric methods to forecast passenger travel is discussed. A nomograph is developed which shows the interaction of economic growth, airline yields, and quality of service in producing international traffic. E.A.K.

N81-31161# Department of Transportation, Washington, D. C.

A REVIEW OF THE DEPARTMENT OF TRANSPORTATION REGULATIONS FOR TRANSPORTATION OF RADIOACTIVE MATERIALS, REVISED 1980

1980 48 p refs
Avail: NTIS Avail: SOD HC

Radioactive materials transportation regulations are summarized. The labeling, packaging, and documentation requirements of principal shippers and carriers for preparing and offering radioactive material packages are presented. Frequently noted discrepancies in radioactive materials shipments are discussed. J.D.H.

N81-31162*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

INFORMATION TRANSFER PROBLEMS IN THE AVIATION SYSTEM

Charles E. Billings, ed. and Ed S. Cheaney, ed. Sep. 1981 95 p refs
(NASA-TP-1875; A-8567) Avail: NTIS HC A05/MF A01 CSCL 17B

Problems in the transfer of information within the aviation system are discussed. Particular attention is given to voice communication problems in both intracockpit and air/ground situations. For individual titles, see N81-31163 through N81-31169.

N81-31163*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DIMENSIONS OF THE INFORMATION TRANSFER PROBLEM

Charles E. Billings and William D. Reynard *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 9-14 refs (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

Several facets of the information transfer problems in aviation are described. A general analysis of these problem are given and the implications of some proposed solutions discussed. It is concluded that information transfer problems are responsible for many potentially serious human errors in aviation operations. R.C.T.

N81-31164*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER IN THE SURFACE COMPONENT OF THE SYSTEM: PROBLEMS ASSOCIATED WITH BRIEFING OF RELIEF CONTROLLERS
Ralph L. Grayson *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 15-24 (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

The types of human error associated with briefing of relief in air traffic control operations are described. The factors associated with these errors are examined. R.C.T.

N81-31165*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER IN THE SURFACE COMPONENT OF THE SYSTEM: COORDINATION PROBLEMS IN AIR TRAFFIC CONTROL
Ralph L. Grayson *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 25-46 refs (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

The significance of coordination in the air traffic control system is discussed. An attempt is made to determine the circumstances that appear to encourage coordination failures as well as examine the human and system factors involved in these failures. Possible means of reducing the rate of such failures are also considered. R.C.T.

N81-31166*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER BETWEEN AIR TRAFFIC CONTROL AND AIRCRAFT: COMMUNICATION PROBLEMS IN FLIGHT OPERATIONS
Ralph L. Grayson and Charles E. Billings *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 47-61 ref (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

Problems in communications between flightcrews and air traffic controllers were investigated as part of an analysis of information transfer problems in the national aviation system. Particular attention was given to problems in oral communication between pilots and controllers. R.C.T.

N81-31167*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER WITHIN THE COCKPIT: PROBLEMS IN INTRACOCKPIT COMMUNICATIONS
H. Clayton Foushee and Karen L. Manos *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 63-71 refs (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

The role of communication patterns among cockpit crew members is discussed. Emphasis is placed on information transfer problems which include: messages that are untimely; messages that are not received or understood; and less common, messages that are not transferred because of equipment failure. R.C.T.

N81-31168*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER DURING CONTINGENCY OPERATIONS: EMERGENCY AIR-GROUND COMMUNICATIONS
Richard F. Porter *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 73-83 ref (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

Safety related problems are reported which occur as a consequence of information transfer deficiencies that arise when air/ground communications are (or should be) used as a resource in inflight emergency situations. The system factors, the human errors, and the associated causes of these problem are defined. R.C.T.

N81-31169*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INFORMATION TRANSFER PROBLEM SUMMARY AND COMMENTS
Charles E. Billings and Ed S. Cheaney *In its* Inform. Transfer Probl. in the Aviation System Sep. 1981 p 85-94 refs (For primary document see N81-31162 22-03)
Avail: NTIS HC A05/MF A01 CSCL 17B

An attempt is made to illuminate the problems associated with deficiencies in the information transfer process of both intracockpit and air/ground communications. Possible steps are suggested as a means of enhancing the flow of information in the aviation system. R.C.T

N81-31170# Research Inst. of National Defence, Stockholm (Sweden).
THE USE OF INDUCTIVE POSITION SWITCHES IN PERSONNEL SAFETY SYSTEMS [INDUKTIVA LAEGESKOPPLARE I PERSONSAEKERHETSSYSTEM]
Haaken Wernstroem and Mats Gunnerhed Sep. 1979 28 p refs In SWEDISH
(FOA-C-30166-E5) Avail: NTIS HC A03/MF A01

The results of evaluating the inductive position switch in personnel safety systems are presented. Fail-safe aspects and the impact of external factors (mechanical, temperature, magnetism, and electricity) are discussed. The pros and cons of various types of switches are addressed. J.M.S.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N81-31171*# BioTechnology, Inc., Falls Church, Va.
A FLIGHT INVESTIGATION OF SIMULATED DATA-LINK COMMUNICATIONS DURING SINGLE-PILOT IFR FLIGHT. VOLUME 1: EXPERIMENTAL DESIGN AND INITIAL TEST
Final Report
James F. Parker, Jr., Jack W. Duffy, and Diane G. Christensen Washington NASA Aug. 1981 61 p refs
(Contract NAS1-16037)
(NASA-CR-3461-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 17G

A Flight Data Console simulation of a digital communication link to replace the current voice communication system used in air traffic control (ATC) was developed. The study determined how a digital communications system reduces cockpit workload, improve, flight proficiency, and is acceptable to general aviation pilots. It is shown that instrument flight, including approach and landing, can be accomplished by using a digital data link system for ATC communication. E.A.K.

N81-31172# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ADVANCES IN INERTIAL NAVIGATION SYSTEMS AND COMPONENTS
Helmut W. Sorg, ed. Apr. 1981 140 p refs
(AGARD-AG-254; ISBN-92-835-1383-5) Avail: NTIS HC A07/MF A01

Three major developments of the last decade are covered. These are: the dry tuned gyro, the laser gyro, and the strapdown technology, taking into consideration cost reduction and higher

reliability. For individual titles, see N81-31173 through N81-31179.

N81-31173# Anschuetz and Co. G.m.b.H., Kiel (West Germany).
TUNED GYRO COST REDUCTION THROUGH A NOVEL HINGE DESIGN
Ruediger Haberland and Harmut Karnick *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 13 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The gyro hinge design described combines producibility with high performance capability due to optimal flexure contour and utilization of design space. Its indirect effect on the design and the effort for manufacturing and calibrating dtg's was shown with respect to strapdown gyros in the size ranging from 12 to 23 mm rotor radius. The following cost-reducing consequences on gyro design and calibration can be noted: (1) no need for multi-gimbal design even in the inertial quality domain with day to day repeatability down to 0.01 deg/h; (2) no need for gimbal balancing in the same domain; (3) no tuning treatment what ever for gyros of day to day repeatability of more than 0.1 deg/h to 1 deg/h, dependent on size and pickoff stability; (4) reduction of tuning treatment to suspension pre-tuning for most inertial grade gyros; and (5) reduced influence of elastic modulus variations. Consequent utilization of this potential renders gyro concepts of specific simplicity and cost effectiveness in each application range from low performance to inertial quality. E.D.K.

N81-31174# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
OPTICAL ROTATION RATE SENSORS
G. E. Knausenberger *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 40 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The measurement of inertial rotation using optical methods are based on two principles: one on the Sagnac effect, leading to the rightlasers (RLG) and its derivatives and two other based on the spin of the nuclei leading to the nuclear magnetic resonance gyro (NMRG or MRG). In the case of the RLG the inertial reference quantity is the velocity of light since it is independent of the platform motion. In the case of the MRG, one attempts to derive the inertial reference from the spin vector of a conglomerate of oriented atomic nuclei. Successful approaches are so far limited to inertial angular velocity measurement via comparison with a magnetic field induced Larmor precession of the nuclei. Both methods rely on optical operating and readout means. Justification for pursuing both approaches derives from the fact that the RLG requires a certain size and mechanical precision in construction while the MRG has the potential for greater miniaturization. On the other hand, recent RLG work indicates possibilities for significant sensitivity increase and optimum adaptability to specific environments and missions. E.D.K.

N81-31175# Litton Systems, Inc., Woodland Hills, Calif. Guidance and Control Systems Div.
A NUCLEAR MAGNETIC RESONANCE GYRO USING NOBLE GAS ISOTOPES
E. Kanegsberg *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 5 p (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

A nuclear Magnetic Resonance (NMR) Gyro is an inertial angle sensor in which the inertial properties are derived from an intrinsic angular momentum and magnetic moment associated with the nuclei of certain atomic isotopes. Such magnetic moments precess in a magnetic field. A measurement of the shift in precession phase angle is used to obtain the gyro rotation information. The general requirements of NMR gyro operation include the existence of a measurable magnetic moment, the ability to make a continuous high precision measurement of the precession phase of such moments, and a means of distinguishing between rotation effects and magnetic field effects. An approach which satisfies these requirements utilizes two isotopes of the noble gases as the inertial sensors and uses an optically pumped rubidium magnetometer as the readout mechanism. A breadboard NMR gyro utilizing this aproach was tested and is characterized by a high signal to noise ratio and a low random bias drift. E.D.K.

N81-31176# Hamilton Standard, Farmington, Conn.
HAMILTON STANDARD SUPERJET SOLID STATE FLUIDIC RATE SENSOR
Richard E. Swarts, Robert J. Slabinski, and Mario T. Lopiccolo *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 16 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The sensor is a solid state fluidic rate sensor replacing conventional inertia wheel gyroscopes in applicatons where high shock loading, rapid turn on, and long storage life are important. Applied angular rates are measured by means of the Coriolis acceleration generated deflection of a recirculated gas jet flow. This gas jet flow is used to differentially cool a precision temperature sensitive wire pair located downstream in the jet flow. The instrument contains no rotating or mating sliding parts. The sensors is a small, lightweight, low power consumption device which is capable of extreme over ranging without degradation of performance upon recovery. A description of the Superjet (TM) sensor and its associated supporting electronics is presented. Discussions of the theory of operation, design implementation, and test results substantiating the performance capability of the unit are included. Data are presented which demonstrate capabilities of 0.3 deg/sec null offset over temperature, 0.02 deg/sec resolution, and 1.0 % scale factor linearity for rates up to 150 deg/sec. E.D.K.

N81-31177# Office National d'Etudes et de Recherches Aeronautiques, Paris (France).
THE CACTUS ACCELEROMETER
Alain Bernard, Michel Gay, and Remy Juillerat *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 10 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The functioning of Cactus (ultra-sensitive, three axis, capacitive accelerometric transducer) is based on the measurement of the force necessary to maintain a reference or proof mass within a cage without any material contact. This force is the resultant of three orthogonal electrostatic attraction forces. Each of them is generated by an electronic circuit fed with the measure of the relative position of the proof mass within the cage. Each of these circuits thus ensures a servo-positioning function of the proof mass. The whole apparatus being mounted on board a spacecraft, the forces that can create a relative movement of the proof mass within the cage are on the one hand, the surface forces acting on the spacecraft, and on the other hand, the inertial forces resulting from the spacecraft movement about its center of mass. The forces of the first kind are due to radiation pressure and to the drag resulting from the impact of gas molecules on the spacecraft surfaces. Those of the second kind can be minimized by a thorough centering and a sufficiently small amplitude of the spacecraft movement. The apparatus permits the measurement of the resultant of these surface forces, this resultant being measured in terms of force per unit mass, or accelerations. E.D.K.

N81-31178# Honeywell Systems and Research Center, Minneapolis, Minn.
INERTIAL SYSTEM ALIGNMENT AND CALIBRATION ON A MOVING BASE
Mario B. Ignagni *In* AGARD Advances in Inertial Navigation Systems and Components Apr. 1981 13 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The problem of optimally aligning and calibrating an inertial navigation system on a moving base is addressed. A comprehensive solution to this class of problems is given and shown to be optimal, subject only to structural constraint normally imposed by practical implementation limitations. E.D.K.

N81-31179# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
IDENTIFICATION AND DETERMINATION OF STRAPDOWN ERROR-PARAMETERS BY LABORATORY TESTING
D. K. Joos and U. K. Krogmann *In* AGARD Advances in

Inertial Navigation Systems and components Apr. 1981 37 p refs (For primary document see N81-31172 22-04)
Avail: NTIS HC A07/MF A01

The performance of an inertial navigation system (INS) is largely affected by a number of important error sources, where most of which are related to the instruments used. This particularly applies to strapdown systems. Laboratory test procedures are described which determine static and dynamic parameters of the gyro and accelerometer measurement model. It is shown that a proper rate test and a multiposition test with respect to Earth rate and gravity vector are well suited to ascertain static parameters with sufficient accuracy. Optimal parameter values are retrieved from measured test data applying regression analysis techniques. It is shown how uncertainties in parameter estimates can be determined from actual measurement residues. The verification of major dynamic performance parameters of interest by appropriate test procedures utilizing a three axes test table is shown. Applicability and feasibility of the proposed test procedures are demonstrated utilizing the modular strapdown system. E.D K

N81-31180# Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR MICROWAVE LANDING SYSTEM (MLS) AIRBORNE RECEIVING EQUIPMENT
Jul. 1981 112 p refs
(RTCA/DO-177) Avail: NTIS HC A06/MF A01

Incorporated within these standards are system characteristics that will be beneficial to the various users of the system as well as designers, manufacturers and installers. A configuration of airborne receiving equipment is limited to: antenna system, transmission lines, angle guidance receiver, receiver control unit and interface with aircraft displays/systems which, for the near term, deals specifically with the angle-only receiver exclusive of distance measuring equipment (DME). Additional functions and components that refer to expanded capabilities are identified as optional features. T.M.

N81-31181# Federal Aviation Agency, Atlantic City, N.J.
ACTIVE BEACON COLLISION AVOIDANCE LOGIC EVALUATION. VOLUME 1: MODE C EQUIPPED (ATCRBS) THREAT PHASE Final Report
A. Adkins, B. Billmann, J. Thomas, and J. Windle Jun. 1981 92 p refs
(FAA Proj. 052-241-320)
(AD-A102163; FAA-CT-80-51-1; FAA-RD-80-125-1) Avail: NTIS HC A05/MF A01 CSCL 01/2

The purpose of this project was to evaluate and refine the April 1979 version of the Beacon Collision Avoidance System (BCAS) logic prior to Active BCAS prototype flight testing. The April 1979 version of the BCAS logic added changes to support multiple aircraft resolution, conflict indicator register interfacing, and new surveillance function interfacing. The first phase of the evaluation was conducted from April 1979 to September 1979. This phase evaluated logic performance against mode C equipped (ATCRBS) threats. The evaluation identified modifications which could improve logic performance. Interim improvements have been made to the vertical tracker. The modifications improve command sense choice logic performance for ATCRBS threats (by using greater dependence on current relative vertical position), resolution performance (by modifying ATCRBS-threat sense choice logic), and vertical speed limit (VSL) alarm performance. Generally, good protection was provided by the BCAS logic against abrupt horizontal maneuvers by ATCRBS threats. VSL alarms generated sufficient vertical separation when the BCAS aircraft's vertical rate was above 1,000 feet per minute. Below 1,000 feet per minute, tracker noise often resulted in a transition from VSL alarms to positive or negative BCAS maneuver advisories. Before proceeding to subsequent phases of the evaluation, large portions of the logic modifications that were identified in this report became permanent algorithm changes. Author (GRA)

N81-31182# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
NAS AUTOMATION EQUIPMENT OPERATING COST ESTIMATES, FY 1978 - 1979
Jerry Collins Jun. 1981 92 p refs
(AD-A102023; FAA-APO-81-6) Avail: NTIS HC A05/MF A01 CSCL 05/1

This report provides summary information related to the cost of maintenance and support of certain system elements of the National Airspace System. Specific equipments for which support costs were developed include the major automation equipments of the enroute and the terminal air traffic control systems. The reader is reminded that this study effort was initiated prior to the formal establishment of the Computer Replacement Program and that the equipment under consideration for replacement is only partially matched by the list of equipment addressed in the study. The information developed should prove useful, however, in evaluating equipment common to both sets. The equipments which are the basis for this report cost about $137 million in support and maintenance during FY 1979. Of this total, about $112 million (82%) was labor, $9 million (6%) was material and $16 million (12%) was services. Of the total $112,218,000 of FAA labor AIRWAY FACILITIES cost $78,947,000 (70%), AIR TRAFFIC software support was $30,027,000 (27%) and other labor was $3,244,000 (3%). Support of the Enroute equipments cost $79,647,000 (58%) and Terminal equipments cost $57,339,000 (42%). Author (GRA)

N81-31183# Quinby (Gilbert F.), Fort Washington, Pa.
PROCEEDINGS OF THE PUBLIC WORKSHOP ON ALTERNATIVE SEPARATION CONCEPTS: PRESENTATIONS, DISCUSSIONS AND RECOMMENDATIONS Final Report
Jun. 1981 208 p Workshop held at Atlantic City, 7-9 Jan. 1981
(Contract DTFA03-80-C-00082)
(AD-A102519; FAA-EM-81-7) Avail: NTIS HC A10/MF A01 CSCL 17/7

This report documents the proceedings of a Federal Aviation Administration (FAA) public workshop on Alternative Separation Concepts during January 7-9, 1981. The first day was devoted to presentations describing FAA/NASA ongoing programs to improve the ATC system with an emphasis on those aspects which would directly improve the services offered to pilots. These improvements would primarily ease the entry into and exit from the IFR system, and the accommodation of pilot preferred routings. The second and part of the third day were devoted to participant discussions which are unrecorded. There were three working groups, technical, procedural and economic which reported their recommendations at the close of the workshop. The participants at the workshop did not identify a fundamentally new concept for air traffic control. They concluded that it would be desirable to continue development of existing and planned Secondary Surveillance Radar-based systems. The promising approaches to system improvements to permit a greater degree of freedom of GA operations were classified by the availability of surveillance services. Within ground-based surveillance coverage, and automatic ground-based primary separation service was the recommended approach. Outside of surveillance coverage, an airborne-based primary separation service utilizing the signal format of the improved secondary surveillance radar system was recommended for further development.
Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N81-31184*# Kentron International, Inc., Hampton, Va.
DESIGN AND ANALYSIS OF A FUEL-EFFICIENT SINGLE-ENGINE, TURBOPROP-POWERED, BUSINESS AIRPLANE
G. L. Martin, D. E. Everest, Jr., W. A. Lovell, J. E. Price, K. B. Walkley, and G. F. Washburn Hampton, Va. NASA. Langley Research Center Aug. 1981 37 p refs
(Contract NAS1-16000)
(NASA-CR-165768) Avail: NTIS HC A03/MF A01 CSCL 01C

The speed, range, payload, and fuel efficiency of a general

aviation airplane powered by one turboprop engine was determined and compared to a twin engine turboprop aircraft. An airplane configuration was developed which can carry six people for a noreserve range of 2,408 km at a cruise speed above 154 m/s, and a cruise altitude of about 9,144 m. The cruise speed is comparable to that of the fastest of the current twin turboprop powered airplanes. It is found that the airplane has a cruise specific range greater than all twin turboprop engine airplanes flying in its speed range and most twin piston engine airplanes flying at considerably slower cruise airspeeds. E.A.K.

N81-31185*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VEHICLE CONCEPTS AND TECHNOLOGY REQUIREMENTS FOR BUOYANT HEAVY-LIFT SYSTEMS

Mark D. Ardema Sep. 1981 18 p refs

(NASA-TP-1921; A-8022) Avail: NTIS HC A02/MF A01 CSCL 01C

Several buoyant-vehicle (airship) concepts proposed for short hauls of heavy payloads are described. Numerous studies identified operating cost and payload capacity advantages relative to existing or proposed heavy-lift helicopters for such vehicles. Applications involving payloads of from 15 tons up to 800 tons were identified. The buoyant quad-rotor concept is discussed in detail, including the history of its development, current estimates of performance and economics, currently perceived technology requirements, and recent research and technology development. It is concluded that the buoyant quad-rotor, and possibly other buoyant vehicle concepts, has the potential of satisfying the market for very heavy vertical lift but that additional research and technology development are necessary. Because of uncertainties in analytical prediction methods and small-scale experimental measurements, there is a strong need for large or full-scale experiments in ground test facilities and, ultimately, with a flight research vehicle. Author

N81-31186# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

FACTORS OF SAFETY RELATED TO STRUCTURAL INTEGRITY. A REVIEW OF DATA FROM MILITARY AIRWORTHINESS AUTHORITIES

Jun. 1981 44 p

(AGARD-R-677; ISBN-92-835-1390-8) Avail: NTIS HC A03/MF A01

The numerical factors applied to insure structural safety of aircraft are presented. Documents and specifications where the factors of safety are defined are identified. The relation of design conditions to extreme operational conditions is considered. Relevant aerodynamic effects taken into account in addition to the safety factors are discussed. The application of the safety factors to rare events, loading, and to experimental aircraft is discussed. Varying interpretations of the factors of safety are considered, and differences between the NATO countries with regard to structural safety are discussed. J.D.H.

N81-31187# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

STATISTICAL REVIEW OF COUNTING ACCELEROMETER DATA FOR NAVY AND MARINE FLEET AIRCRAFT FROM 1 JANUARY 1962 TO 31 DECEMBER 1980 Semiannual Summary Report, 1 Jan. - 31 Dec. 1980

Warren J. Williams 1 May 1981 156 p Supersedes NADC-13920-2 Prepared for Naval Air Systems Command, Washington, D.C.

(AD-A102495; NADC-13920-2) Avail: NTIS HC A08/MF A01 CSCL 01/1

This is a semi-annual progress report, and it presents a specialized summary of the data in the counting accelerometer program. Statistics describing Navy and Marine aircraft cumulative g-count exceedances are calculated and tabulated. These tabulations are separated by calendar time and into four major categories of fleet experience: Navy Training, Navy Combat, Marine Training, and Marine Combat. These data show that the load rate distributions (counts at 1000 hours) for most models and most g-levels have a non-normal distribution. Within a model (A-7E, F-4N, etc.) differences in the average load rates exist when data are separated by calender time or mission category. Author (GRA)

N81-31188# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

TRANSITION AND CONVERSION TRIM-MAPS FOR THE AV-8A VTOL AIRCRAFT Final Report

Bruce Hildreth Aug. 1980 148 p refs

(Contract N00014-78-C-0381; NR Proj. 215-262)

(AD-A102155; MAE-1466; ONR-CR-215-262-1F) Avail: NTIS HC A07/MF A01 CSCL 01/2

A mathematical computer model, 'HARRIER' of the AV-8A Harrier aircraft has been developed utilizing the concept of quasi-stationary flight in order to determine quasi-equilibrium values of flight variables and controls during accelerating-decelerating flight. Using available aerodynamic data via look-up schemes, 'trim-maps' are computed which show the values of the longitudinal flight and control variables as functions of airspeed and thrust angle. These maps have been shown to be useful tools in piecing together transition profiles, taking in consideration various requirements and constraints. The final decelerating-descending phase of the present USMC approach profile has been analyzed in detail with the aid of the trim-maps. The technique of flying the transition as suggested by the trim-maps has been found in good agreement with the techniques actually used under the given constraints. This established confidence in both the mathematical model and in the trim-maps as tools for studying alternate transition profiles. Author (GRA)

N81-31189# National Aerospace Lab., Amsterdam (Netherlands).

DAMAGE TOLERANCE OF A LANDING GEAR COMPONENT AFTER MANY TAKEOFFS AND LANDINGS

E. A. B. Degraaf, P. deRijk, and G. F. J. A. vanGestel 10 Oct. 1979 17 p refs In DUTCH; ENGLISH summary Presented at Ann. Conf. of German Soc. for Nondestructive Testing, Goettingen, West Germany, 12-14 May 1980

(NLR-MP-79039-U) Avail: NTIS HC A02/MF A01

A test procedure was applied to establish the damage tolerance of a landing gear component showing fatigue cracking. During an inspection almost all specimens of the particular low alloy high strength steel component showed cracks after many starts and landings. Continued safe operation was shown to be possible by means of a systematic establishment of the residual strength of the most heavily cracked components, simultaneously with an evaluation of the accuracy of several nondestructive inspection methods: fluorescent magnetic powder method, fluorescent paint penetration and eddy currents. The correspondence between defect indication and actual fatigue nucleus sizes, as measured from the fracture surface, is clearly demonstrated. On the basis of the tests the components were shown to be damage tolerant and a nondestructive inspection procedure for subsequent components established. Author (ESA)

N81-31106*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AERODYNAMIC MATHEMATICAL MODELING - BASIC CONCEPTS

Murray Tobak and Lewis B. Schiff *In* AGARD Dyn. Stability Parameters May 1981 31 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01

N81-31115# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

DETERMINATION OF AIRCRAFT DYNAMIC STABILITY AND CONTROL PARAMETERS FROM FLIGHT TESTING

P. G. Hamel *In* AGARD Dyn. Stability Parameters May 1981 42 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01

N81-31120# National Aeronautical Establishment, Ottawa (Ontario).

SENSITIVITY OF AIRCRAFT MOTION TO CROSS COUPLING AND ACCELERATION DERIVATIVES

K. J. Orlik-Rueckemann *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)

Avail: NTIS HC A17/MF A01

N81-31121*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME APPLICATIONS OF AERODYNAMIC FORMULATIONS TO PROBLEMS IN AIRCRAFT DYNAMICS
Lewis B. Schiff and Murray Tobak *In* AGARD Dyn. Stability Parameters May 1981 15 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

N81-31143*# Rockwell International Corp., Los Angeles, Calif.
AIRCRAFT DESIGN USING THE NATIONAL TRANSONIC FACILITY
E. Bonner *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 149-152 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N81-31190*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FIBER OPTICS FOR AIRCRAFT ENGINE/INLET CONTROL
Robert J. Baumbick 1981 13 p refs Presented at the Intern. Symp. and Instrument Display, San Diego, Calif., 24-28 Aug. 1981; sponsored by the Society of Photo-Optical Instrumentation Engineers
(NASA-TM-82654; E-917) Avail: NTIS HC A02/MF A01 CSCL 01D

NASA programs that focus on the use of fiber optics for aircraft engine/inlet control are reviewed. Fiber optics for aircraft control is attractive because of its inherent immunity to EMI and RFI noise. Optical signals can be safely transmitted through areas that contain flammable or explosive materials. The use of optics also makes remote sensing feasible by eliminating the need for electrical wires to be connected between sensors and computers. Using low-level optical signals to control actuators is also feasible when power is generated at the actuator. Each application of fiber optics for aircraft control has different requirements for both the optical cables and the optical connectors. Sensors that measure position and speed by using slotted plates can use lossy cables and bundle connectors if data transfer is in the parallel mode. If position and speed signals are multiplexed, cable and connector requirements change. Other sensors that depend on changes in transmission through materials require dependable characteristics of both the optical cables and the optical connectors. A variety of sensor types are reviewed, including rotary position encoders, tachometers, temperature sensors, and blade tip clearance sensors for compressors and turbines. Research on a gallium arsenide photoswitch for optically switched actuators that operate at 250 C is also described.
Author

N81-31191# Naval Air Development Center, Warminster, Pa. Software and Computer Directorate.
HIGH SPEED MULTIPLEX BUS PROTOCOL STUDY
James S. Verdi 15 Jun. 1980 92 p refs Prepared for Naval Air Systems Command, Washington, D.C.
(WF21200000; WF212421091)
(AD-A102113; NADC-81049-50) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report presents the current results of an evaluation performed in support of the development of an advanced high speed digital avionics data bus. Emphasis is placed on certain areas of protocol design and implementation which have not been approaches very aggressively in other development efforts. These areas include a transaction oriented protocol design and greatly increased level of protocol definition stressing VLSI (and perhaps VHSIC) implementation. A detailed but preliminary protocol design is included to illustrate the concepts presented.
Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N81-31192*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
MECHANICAL PROPERTIES OF TURBINE BLADE ALLOYS IN HYDROGEN AT ELEVATED TEMPERATURES Final Report
D. P. DeLuca Jul. 1981 132 p refs
(Contract NAS8-33561)
(NASA-CR-161842; FR-14844) Avail: NTIS HC A07/MF A01 CSCL 21E

The mechanical properties of single crystal turbine blade alloys in a gaseous hydrogen environment were determined. These alloys are proposed for use in space propulsion systems in pure or partial high pressure hydrogen environments at elevated temperatures. Mechanical property tests included: tensile, creep, low fatigue (LCF), and crack growth. Specimens were in both transverse and longitudinal directions relative to the casting solidification direction. Testing was conducted on solid specimens exposed to externally pressurized environments of gaseous hydrogen and hydrogen-enriched steam.
E.A.K.

N81-31193*# TRW, Inc., Cleveland, Ohio.
AUTOMATED PLASMA SPRAY (APS) PROCESS FEASIBILITY STUDY Final Contractor Report, Jun. 1976 - Mar. 1981
C. W. Fetheroff, T. Derkacs, and I. M. Matay Mar. 1981 131 p refs
(Contract NAS3-20112)
(NASA-CR-165418; TRW-ER-8019-F) Avail: NTIS HC A07/MF A01 CSCL 21E

An automated plasma spray (APS) process was developed to apply two layer (NiCrAlY and ZrO2-12Y2O3) thermal barrier coatings to aircraft and stationary gas turbine engine blade airfoils. The APS process hardware consists of four subsystems: a mechanical positioning subsystem incorporating two interlaced six degree of freedom assemblies (one for coating deposition and one for coating thickness monitoring); a noncoherent optical metrology subsystem (for in process gaging of the coating thickness buildup at specified points on the specimen); a microprocessor based adaptive system controller (to achieve the desired overall thickness profile on the specimen); and commerical plasma spray equipment. Over fifty JT9D first stage aircraft turbine blade specimens, ten W501B utility turbine blade specimens and dozens of cylindrical specimens were coated with the APS process in preliminary checkout and evaluation studies. The best of the preliminary turbine blade specimens achieved an overall coating thickness uniformity of 53 micrometers (2.1 mils), much better than is achievable manually. Comparative evaluations of coating thickness uniformity for manually sprayed and APS coated specimens were performed. One of the preliminary turbine blade evaluation specimens was subjected to a torch test and metallograhic evaluation. Some cylindrical specimens coated with the APS process survived up to 2000 cycles in subsequent burner rig testing.
Author

N81-31194*# General Electric Co., Cincinnati, Ohio. Technology Programs and Performance Technology Dept.
STRUCTURES PERFORMANCE, BENEFIT, COST-STUDY Final Report
Otto G. Woike, C. Salemme, E. Stearns, P. Oritz, M. L. Roberts, J. L. Baughman, R. P. Johnston, H. F. Demel, R. G. Stabrylla, and G. A. Coffinberry Sep. 1981 195 p refs
(Contract NAS3-22049)
(NASA-CR-165456; R81AEG393) Avail: NTIS HC A09/MF A01 CSCL 21E

New technology concepts and structural analysis development needs which could lead to improved life cycle cost for future high-bypass turbofans were studied. The NASA-GE energy efficient

engine technology is used as a base to assess the concept benefits. Recommended programs are identified for attaining these generic structural and other beneficial technologies. T.M.

N81-31195*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED SUBSONIC TRANSPORT PROPULSION
Donald L. Nored, Carl C. Ciepluch, Roger Chamberlain, Edward T. Meleason, and Gerald A. Kraft 1981 32 p refs Presented at the Intern. Air Transportation Conf., Atlantic City, N.J. 26-28 May 1981; sponsored by AIAA and SAE
(NASA-TM-82696; E-979) Avail: NTIS HC A03/MF A01 CSCL 21E

A brief review of the current NASA Energy Efficient Engine (E(3)) Project is presented. Included in this review are the factors that influenced the design of these turbofan engines and the advanced technology incorporated in them to reduce fuel consumption and improve environmental characteristics. In addition, factors such as the continuing spiral in fuel cost, that could influence future aircraft propulsion systems beyond those represented by the E(3) engines, are also discussed. Advanced technologies that will address these influencing factors and provide viable future propulsion systems are described. The potential importance of other propulsion system types, such as geared fans and turboshaft engines, is presented. T.M.

N81-31196*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIRCRAFT ENGINE DIAGNOSTICS
Jul. 1981 377 p refs Conf. held at Cleveland, 6-7 May 1981
(NASA-CP-2190; E-845) Avail: NTIS HC A17/MF A01 CSCL 21E

Engine durability and performance retention concepts are discussed. Other topics include engine diagnostics for performance retention and engine condition monitoring systems. For individual titles, see N81-31197 through N81-31217.

N81-31197*# General Electric Co., Schenectady, N. Y.
CF 6 ENGINE DIAGNOSTICS
Ron Stricklin *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 1-17 refs (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

A summary of the activities which led to defining deterioration rates of the CF6 family of engines, a description of what was learned, and an identification of means of conserving fuel based upon the program findings are presented. The program to define the deterioration levels and modes for the CF6 family of engines involved four distinct phases: analysis of inbound engine test results, analysis of airline cruise data, analysis of airline test cell data resulting from testing of refurbished engines, and inspection of engine hardware. E.D.K

N81-31198*# General Electric Co., Schenectady, N. Y
CF6 HIGH PRESSURE COMPRESSOR AND TURBINE CLEARANCE EVALUATIONS
M. A. Radomski and L. D. Cline *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 19-42 refs (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

In the CF6 Jet Engine Diagnostics Program the causes of performance degradation were determined for each component of revenue service engines. It was found that a significant contribution to performance degradation was caused by increased airfoil tip radial clearances in the high pressure compressor and turbine areas. Since the influence of these clearances on engine performance and fuel consumption is significant, it is important to accurately establish these relatonships. It is equally important to understand the causes of clearance deterioration so that they can be reduced or eliminated. The results of factory engine tests run to enhance the understanding of the high pressure compressor and turbine clearance effects on performance are described. The causes of clearance deterioration are indicated and potential improvements in clearance control are discussed. E.D.K.

N81-31199*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
JT9D JET ENGINE DIAGNOSTICS PROGRAM
W. J. Olsson and W. J. Stromberg *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 43-61 refs (For primary document see N81-31196 22-07)
(Contract NAS3-20632)
Avail: NTIS HC A17/MF A01 CSCL 21E

Performance deterioration in the JT9D-7 is a flight sensitive phenomenon caused by one short term and two long term wear modes. The short term deterioration occurs primarily during airplane acceptance testing and therefore does not affect airline operation. The long term wear takes place continuously over the engine life so that the performance loss can be minimized by a sound maintenance program. Short term deterioration is primarily due to flight load induced blade and gas path seal wear which result in increased gas path running clearances. The wear occurs in all engine modules but has the most deleterious effect on the low pressure compressor and high pressure turbine performance. The wear occurs during conditions that combine minimum axisymmetric running clearances and maximum engine distortion or asymmetric closure. E.D.K.

N81-31200*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
JT8D ENGINE PERFORMANCE RETENTION
Albert D. James and David R. Weisel *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 63-81 ref (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

The attractive performance retention characteristics of the JT8D engine are described. Because of its moderate bypass ratio and turbine temperature, and stiff structural design, the performance retention versus flight cycles of the JT8D engine sets a standard that is difficult for other engines to equal. In addition, the significant benefits of refurbishment of the JT8D engine are presented. Cold section refurbishment offers thrust specific fuel consumption improvements of up to 2 percent and payback in less than a year, making a very attractive investment option for the airlines. E.D.K.

N81-31201*# Rolls-Royce Ltd., London (England).
PERFORMANCE RETENTION OF THE RB211 POWERPLANT IN SERVICE
B. L. Astridge and J. T. Pinder *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 83-102 (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

An understanding of the mechanisms of deterioration is essential in order that features to counteract performance degradation can be built into the basic design of an engine and nacelle. Furthermore, the interpretation must be continued in service for effective feedback to provide modifications which may be necessary in maintaining a satisfactory performance retention program. The in service assessment must be accurate as to magnitude and causes and this requires consideration of: (1) the powerplant as a complete entity, i.e., the engine components and nacelle including the thrust reverser; (2) measurement of performance in flight rather than by sole reliance on the scaling of test cell data to flight conditions (although some correlation should be possible); and (3) the relationship of engine parts condition to overhaul performance and in flight deterioration level of that engine. These aspects are addressed by consideration of the RB211 engine in service in both the Lockheed L1011 Tristar and Boeing 747 aircraft. E.D.K.

N81-31202*# Pan American World Airways, Inc., Jamaica, N.Y.
PERFORMANCE DETERIORATION: AN AIRLINE PERSPECTIVE
Niels B. Andersen *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 103-108 (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

Certain features of engine design and installation are clearly demonstrating important advantages in engine performance retention. Bearing arrangement no doubt has an important role in performance retention. Four bearings seem to be insufficient while six are probably more than are required. A well designed five-bearing system would seem to be an optimum configuration.

Bearings with over-hung components such as fans, should be designed to minimize such over-hang to limit associated wobble, which in turn leads to shroud rub, or to allow closer running clearances. Almost any effort to improve stiffness and generally reduce flexing of the engine structure will pay off significantly in performance retention, even at a weight penalty. For this reason cowl load sharing to provide additional rigidity at a low cost in additional weight and complexity is favored. E.D.K.

N81-31203*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

IMPROVING TURBINE ENGINE COMPRESSOR PERFORMANCE RETENTION THROUGH AIRFOIL COATINGS

L. A. Friedrich *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 109-117 refs (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

In order to evaluate the potential effectiveness of coatings in limiting erosive damage to compressor airfoils, an effort was initiated to evaluate candidate coatings for substrate alloys typically used in commercial engine high compressor blades. Laboratory and rig erosion testing of plasma deposited and diffusion coatings described in this paper have shown the potential of a two to four fold improvement in erosion life. The selective application of these coatings to approximately the outer third of the airfoil avoids coating the fatigue critical region of the blade, thus providing erosion resistance potentially without compromising the fatigue strength of the blade. Both the plasma and the diffusion coatings also offer the advantage of low initial cost and a multi-source production base. E.D.K.

N81-31204*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

ADVANCED OXIDE DISPERSION STRENGTHENED SHEET ALLOYS FOR IMPROVED COMBUSTOR DURABILITY

R. J. Henricks *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 119-136 refs (For primary document see N81-31196 22-07)

(Contract NAS3-20072)

Avail: NTIS HC A17/MF A01 CSCL 21E

Burner design modifications that will take advantage of the improved creep and cyclic oxidation resistance of oxide dispersion strengthened (ODS) alloys while accommodating the reduced fatigue properties of these materials were evaluated based on preliminary analysis and life predictions, on construction and repair feasibility, and on maintenance and direct operating costs. Two designs - the film cooled, segmented louver and the transpiration cooled, segmented twin Wall - were selected for low cycle fatigue (LCF) component testing. Detailed thermal and structural analysis of these designs established the strain range and temprature at critical locations resulting in predicted lives of 10,000 cycles for MA 956 alloy. The ODs alloys, MA 956 and HDA 8077, demonstrated a 167 C (300 F) temperature advantage over Hastelloy X alloy in creep strength and oxidation resistance. The MA 956 alloy was selected for mechanical property and component test evaluations. The MA 956 alloy was superior to Hastelloy X in LCF component testing of the film cooled, segmented louver design. J.M.S.

N81-31205*# General Electric Co., Schenectady, N. Y.

ADVANCED TURBINE BLADE TIP SEAL SYSTEM

J. W. Zelahy *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 137-152 (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

An advanced blade/shroud system designed to maintain close clearance between blade tips and turbine shrouds and at the same time, be resistant to environmental effects including high temperature oxidation, hot corrosion, and thermal cycling is described. Increased efficiency and increased blade life are attained by using the advanced blade tip seal system. Features of the system include improved clearance control when blade tips preferentially wear the shrouds and a superior single crystal superalloy tip. The tip design, joint location, characterization of the single crystal tip alloy, the abrasive tip treatment, and the component and engine test are among the factors addressed. Results of wear testing, quality control plans, and the total manufacturing cycle required to fully process the blades are also discussed. J.M.S.

N81-31206*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN INTRODUCTION TO NASA'S TURBINE ENGINE HOT SECTION TECHNOLOGY (HOST) PROJECT

Daniel J. Gaunther and C. Robert Ensign *In its* Aircraft Engine Diagnostics 1981 p 153-173 (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

An overview of research to develop and improve the accuracy of current analysis methods so that increased durability can be designed into future engines is presented. Emphasis is placed on improved accuracy in life prediction. Component design, including description of the thermal and aerodynamic environments, the material's mechanical response, the interactions between environmental and structural response, and high temperature instrumentation capable of measuring near-engine environment effects are addressed. Component tests, improved modeling of the physical phenomena, and tests to verify the proved models are also discussed. J.M.S.

N81-31207*# Boeing Commercial Airplane Co., Seattle, Wash.

THE NATURE OF OPERATING FLIGHT LOADS AND THEIR EFFECT ON PROPULSION SYSTEM STRUCTURES

Kenneth H. Dickenson and Richard L. Martin *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 175-188 (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

Past diagnostics studies revealed the primary causes of performance deterioration of high by-pass turbofan engines to be flight loads, erosion, and thermal distortion. The various types of airplane loads that are imposed on the engine throughout the lifetime of an airplane are examined. These include flight loads from gusts and maneuvers and ground loads from takeoff, landing, and taxi conditions. Clarification is made in definitions of the airframer's limit and ultimate design loads and the engine manufacturer's operating design loads. Finally, the influence of these loads on the propulsion system structures is discussed. J.M.S.

N81-31208*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CONSERVATION OF STRATEGIC AEROSPACE MATERIALS (COSAM)

Joseph R. Stephens *In its* Aircraft Engine Diagnostics 1981 p 189-207 refs (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

Research efforts to reduce the dependence of the aerospace industry on strategic metals, such as cobalt (Co), columbium (Cb), tantalum (Ta), and chromium (Cr), by providing the materials technology needed to minimize the strategic metal content of critical aerospace components for gas turbine engines are addressed. Thrusts in three technology areas are identified: near term activities in the area of strategic element substitution; intermediate-range activities in the area of materials processing; and long term, high risk activities in the area of 'new classes' of high temprature metallic materials. Specifically, the role of cobalt in nickel-base and cobalt-base superalloys vital to the aerospace industry is examined along with the mechanical and physical properties of intermetallics that will contain a minimum of the stragetic metals. J.M.S.

N81-31209*# Air Force Systems Command, Wright-Patterson AFB, Ohio.

WHO NEEDS ENGINE MONITORING?

James L. Pettigrew *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 209-224 ref (For primary document see N81-31196 22-07)

Avail: NTIS HC A17/MF A01 CSCL 21E

Operational evaluations of engine monitoring systems (EMS) are discussed. Options for each required EMS phase are reviewed along with the guidance provided for EMS on new systems. J.M.S.

N81-31210*# Air Force Systems Command, Wright-Patterson AFB, Ohio.

F100 ENGINE DIAGNOSTIC SYSTEM STATUS TO DATE
James A. Boyless *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 225-242 (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

An engine diagnostic system, proposed for the F100 engine, was tested in five specially modified Tactical Air Command F-15 aircraft during a 16-month flight evaluation. After more than 3300 engine operating hours encompassing almost 900 flights during the flight evaluation, these aircraft provided a data base, still being analyzed, that has shown successful demonstration of the original functional characteristics. Four general design requirements, recording engine operating time/low cycle fatigue event detection, engine trim, and trend and performance data collection were demonstrated. Also, validation of maintenance actions taken and indicated needed maintenance were successfully demonstrated. J.M.S.

N81-31211*# San Antonio Air Logistics Center, Kelly AFB., Tex.
A-10/TF34 TURBINE ENGINE MONITORING SYSTEM (TEMS)
Robert G. Christopher *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 271-283 refs (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

The hardware and software development of the A-10/TF34 turbine engine monitoring system (TEMS) is described. The operation and interfaces of the A-10/TF34 TEMS hardware are discussed with particular emphasis on function, capabilities, and limitations. The TEMS data types are defined and the various data acquisition modes are explained. Potential data products are also discussed. R.C.T.

N81-31212*# KLM Royal Dutch Airlines, Amsterdam (Netherlands).
REVIEW OF AIDS DEVELOPMENT
Henk C. Vermeulen and Sven G. Danielsson *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 285-310 refs (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

The operation and implementation of the aircraft integrated data system AIDS are described. The system is described as an engineering tool with strong emphasis on analysis of recorded information. The AIDS is primarily directed to the monitoring of parameters related to: the safety of the flight; the performance of the aircraft; the performance of the flight guidance system; and the performance and condition of the engines. The system provide short term trend analysis on a trend chart that is updated by the flight engineer on every flight that lasts more than 4 flight hours. Engine data prints are automatically presented during take-off and in the case of limit excedance, e.g., the print shows an automatically reported impending hotstarts on engine nr. 1. Other significant features are reported. R.C.T.

N81-31213*# Textron Bell Helicopter, Fort Worth, Tex.
HELICOPTER PROPULSION SYSTEM RELIABILITY AND ENGINE MONITORING ASSESSMENTS
John A. Murphy *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 311-322 refs (For primary document see N81-31196 22-07)
(Contract NAS2-10722)
Avail: NTIS HC A17/MF A01 CSCL 21E

The major short life, unreliable, and high maintenance engine and power components and subsystems in current civil helicopters were identified. Categories included both reciprocating and turbine engines, single and multiple engine configurations, single and tandem trotor vehicles, and light, medium, and heavy helicopters. The major focus was on the following parameters: accident rate data; maintenance rate data; and direct operator input. R.C.T.

N81-31214*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
ENGINE HEALTH MONITORING SYSTEMS: TOOLS FOR IMPROVED MAINTENANCE MANAGEMENT IN THE 1980'S
Jonathan C. Kimball *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 323-340 refs (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

The performance monitoring aspect of maintenance, characteristic of the engine health monitoring system are discussed. An overview of the system activities is presented and a summary of programs for improved monitoring in the 1980's are discussed. R.C.T.

N81-31215*# General Electric Co., Schenectady, N. Y.
ENGINE CONDITION MONITORING: CF6 FAMILY 60'S THROUGH THE 80'S
H. J. Kent and Gerwin Dienger (Lufthansa German Airlines) *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 341-356 (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

The on condition program is described in terms of its effectiveness as a maintenance tool both at the line station as well as at home base by the early detection of engine faults, erroneous instrumentation signals and by verification of engine health. The system encompasses all known methods from manual procedures to the fully automated airborne integrated data system. R.C.T.

N81-31216*# General Electric Co., Schenectady, N. Y.
ENGINE HEALTH MONITORING: AN ADVANCED SYSTEM
R. J. E. Dyson *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 357-375 refs (For primary document see N81-31196 22-07)
(Contract F33615-79-C-2092)
Avail: NTIS HC A17/MF A01 CSCL 21E

The advanced propulsion monitoring system is described. The system was developed in order to fulfill a growing need for effective engine health monitoring. This need is generated by military requirements for increased performance and efficiency in more complex propulsion systems, while maintaining or improving the cost to operate. This program represents a vital technological step in the advancement of the state of the art for monitoring systems in terms of reliability, flexibility, accuracy, and provision of user oriented results. It draws heavily on the technology and control theory developed for modern, complex, electronically controlled engines and utilizes engine information which is a by-product of such a system. R.C.T.

N81-31217*# Textron Bell Helicopter, Fort Worth, Tex.
AN OVERVIEW OF SAE ARP 1587: AIRCRAFT GAS TURBINE ENGINE MONITORING SYSTEM GUIDE
John A. Murphy *In* NASA. Lewis Res. Center Aircraft Engine Diagnostics 1981 p 377-380 (For primary document see N81-31196 22-07)
Avail: NTIS HC A17/MF A01 CSCL 21E

A systematic approach to developing an engine monitoring system (EMS) is outlined. An extensive shopping list of EMS capabilities and benefits are included. A team approach to developing an EMS is emphasized with a description of the responsibilities of each team member. R.C.T.

N81-31218# General Electric Co., Cincinnati, Ohio. Aircraft Engines Business Group.
CF6-50 ENGINE EMISSIONS TESTING WITH TRAVERSE PROBE Final Report, May 1979 - Nov. 1980
T. F. Lyon and D. W. Bahr Jan. 1981 79 p refs
(Contract DOT-FA79NA-6010)
(AD-A102159; R81AEG213; FAA-CT-81-18) Avail: NTIS HC A05/MF A01 CSCL 21/5

The variation in emissions over the exhaust area of a General Electric CF6-50 model engine was investigated in order to determine the requirements for a representative sample. The emission measurements were made in a systematic pattern of 120 sample points using a traversing probe system. These data were used to develop detailed emission profiles at three power levels. At idle power, variations over the exhaust area are attributed to the particular fueling pattern used in current CF6-50 model engines. At higher power levels, where uniform fueling is employed, emission levels are more uniform and are characterized by a slightly peaked radial profile. Average values from the 120-point traverse were comapred with selected 12-point averages in the

EPA prescribed cruciform pattern. Generally good agreement between the two averages was obtained. Author (GRA)

N81-31219# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Turbine Engine Div.
DETERMINATION OF AERODYNAMICALLY ADEQUATE FILLET GEOMETRY IN TURBOCOMPRESSOR BLADE ROWS Final Report, Apr. 1980 - Feb. 1981
Lucien L. DeBruge May 1981 45 p refs
(AF Proj. 2307)
(AD-A102170; AFWAL-TR-81-2020) Avail: NTIS HC A03/MF A01 CSCL 20/4

A method for determining the fillet radius likely to prevent separation of the corner flow at the intersection of an airfoil and a hub or shroud where no relative motion or gap is present is described. A computer program was written which, from the physical dimensions of the blading and the flow characteristics at the blading entrance and exit, calculates the corner boundary layer parameters allowing the prediction of the required fillet radius. An incompressible turbulent flow, with the influence of endwall boundary layer secondary flow on the development of the corner boundary layer, is considered. Author (GRA)

N81-31220# Williams Research Corp., Walled Lake, Mich.
CRUISE MISSILE ENGINE PROGRAM CONTRACT DATA REQUIREMENTS LIST SEQUENCE NUMBER 95. QUALIFICATION TEST REPORT. VOLUME 39: VIBRATION AND MISSION SIMULATION TESTING ON ENGINE 828. XF-107-WR-400 CRUISE MISSILE ENGINE
Laurence Toot Jun. 1981 257 p
(Contract N00019-78-C-0206)
(AD-A102257; WRC-79-106-39; CMEP-95-4120-Vol-39) Avail: NTIS HC A12/MF A01 CSCL 21/5

It is recommended that the testing completed with Engine 828 be accepted as evidence that the F107-WR-400 engine meets or exceeds the requirements for environmental vibration exposure and mission simulation testing as set forth in the PID Specification, 24235WR-9501A, and the Qualification Test Plan, CMEP 91-4043G, Report No. 78-145-8. GRA

N81-31221# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
THREE-DIMENSIONAL MODEL OF SPRAY COMBUSTION IN GAS-TURBINE COMBUSTORS Final Scientific Report, 3 Jan. 1980 - 28 Feb. 1981
F. Boysan, W. H. Ayers, J. Swithenbank, and Z. Pan Nov. 1980 11 p refs
(Grant AF-AFOSR-0174-80; AF Proj. 2308)
(AD-A102506; HIC-354; AFOSR-81-0600TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

A mathematical model of the three dimensional two-phase reacting flows in gas turbine combustors has been developed which takes into account the mass, momentum and energy coupling between the phases. The fundamental equations of motion of the droplets are solved numerically in a Lagrangian frame of reference using a finite difference solution of the governing equations of the gas. Well known relations are used to model the heat and mass transfer processes and the initial droplet heat-up is allowed for. The entire fuel spray is constructed using a finite number of size ranges obeying a two parameter droplet size distribution. The results are found to be in close agreement with experimental data. An important feature of this analytical technique is that it permits the rational selection or specification of fuel nozzle design. Author (GRA)

N81-31222# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
PREVENTION OF CORROSION AND FATIGUE FAILURE OF HELICOPTER GAS TURBINE COMPRESSORS
R. J. H. Wanhill, H. J. Kolkman, A. J. A. Mom, and G. F. J. A. vanGestel Jun. 1980 13 p refs Presented at 6th European Rotorcraft and Powered Lift Aircraft Forum, 16-19 Sep., Bristol, England Sponsored by Directorate of Material Air, Royal Netherlands Air Force
(NLR-MP-80024-U) Avail: NTIS HC A02/MF A01

A failure analysis was performed on the compressor section of a helicopter gas turbine which disintegrated during normal flight. Corrosion pitting and fatigue due to acid rainfall were found to be the cause of the failure. Corrosion tests were carried out on rotor blades from the same type of compressor. Besides evaluation in the compressor rig the tests included exposure to neutral and acid salt spray environments which are conventionally used to determine corrosion resistance. Both uncoated blades, as used in service, and blades with commercially available protective coatings were tested. For the uncoated blades compressor rig testing proved to be severest and resulted in pitting corrosion most representative of that found for service components. The coatings afforded complete protection under all conditions. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N81-31223 Stanford Univ., Calif.
A MODEL-FOLLOWING TECHNIQUE FOR INSENSITIVE AIRCRAFT CONTROL SYSTEMS Ph.D. Thesis
George Cooke Nield, IV 1981 101 p
Avail: Univ. Microfilms Order No. 8115817

The problem of designing multivariable control systems is addressed through the use of model-following methods. A number of different model following techniques are discussed, and their advantages and disadvantages are presented. It is shown the model-following theories can provide useful structural insight to the designer, and that they can help to integrate the methods of 'classical' and 'modern' control. A new design method is presented which, when implemented, uses model following and full-state feedback to keep the dominant roots of a system constant. Under favorable circumstances, it can do this even in the presence of arbitrarily large parameter uncertainties. The method has the attractive feature that the parameter-insensitivity and disturbance-rejection characteristics of the system can be selected independently from the no-disturbance, nominal-plant performance. Application is made to several aircraft flight control problems. Dissert. Abstr.

N81-31224*# Analytical Mechanics Associates, Inc., Hampton, Va.
TERMINAL AREA AUTOMATIC NAVIGATION, GUIDANCE, AND CONTROL 1: AUTOMATIC ROLLOUT, TURNOFF, AND TAXIS Final Report
Samuel Pines Aug. 1981 80 p refs
(Contract NAS1-15116)
(NASA-CR-3451; AMA-80-1) Avail: NTIS HC A05/MF A01 CSCL 17G

A study developed for the TCV B-737, designed to apply existing navigation aids plus magnetic leader cable signals and develop breaking and reverse thrust guidance laws to provide for rapid automated rollout, turnoff, and taxi to reduce runway occupation time for a wide variety of landing conditions for conventional commercial-type aircraft, is described. Closed loop guidance laws for braking and reverse thrust are derived for rollout, turnoff, and taxi, as functions of the landing speed, the desired taxi speed and the distance to go. Brake limitations for wet runway conditions and reverse thrust limitations are taken into account to provide decision rules to avoid tire skid and to choose an alternate turnoff point, farther down the runway, to accommodate extreme landing conditions. Author

N81-31225# Royal Military Coll. of Science, Shrivenham (England). Dept. of Mathematics and Ballistics.
GENERALIZED DYNAMIC STABILITY FOR LINEARIZED YAWING MOTION
P. J. Richards and G. Pagan Oct. 1980 13 p refs
(RMCS-80002; BR78592) Avail: NTIS HC A02/MF A01

The generalized dynamic stability of spinning projectiles is studied by considering the homogeneous linearized equation of yawing motion. The solutions for constant and slowly varying coefficients are considered and it is shown that the possible yawing behaviors may be bounded by an envelope of exponential form, where the base is the magnitude of the first maxima and

the exponent is an integral function of the equation coefficients. A suitable transformation is used to show that a similar bound may be obtained even if the coefficients are general functions. In many situations these bounds may supply the information a designer requires about the performance of a projectile.
Author (ESA)

N81-31226# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
AEROELASTIC BUFFETING PREDICTION TECHNIQUES: A GENERAL REVIEW
Hans Foersching Apr. 1981 54 p refs
(DFVLR-FB-81-15) Avail: NTIS HC A04/MF A01

Analytical techniques for the prediction of the aerolastic buffeting behavior of flexible aircraft are described. The basic characteristics of separated-flow unsteady airloads as they relate to the aeroelastic buffet problem are briefly outlined. The problem of formulating appropriately the various types of regular or irregular buffeting oscillations is treated, and the corresponding mathematical physical models proposed and applied presently are reviewed. The problem of acquisition and conversion of wind tunnel model data to form full scale generalized aerodynamic buffet forcing functions and motion-induced airload terms is discussed in some detail. Author (ESA)

N81-31116*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF DYNAMIC STABILITY PARAMETERS FROM DROP MODEL FLIGHT TESTS
Joseph R. Chambers and Kenneth W. Iliff (NASA. Hugh L. Dryden Flight Research Center) *In* AGARD Dyn. Stability Parameters May 1981 13 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

N81-31117# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ANALYTICAL DETERMINATION OF DYNAMIC STABILITY PARAMETERS
C. P. Schneider *In* AGARD Dyn. Stability Parameters May 1981 40 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31119# Royal Aircraft Establishment, Farnborough (England).
CONTROL DERIVATIVES
A. Jean Ross *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N81-31227*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NATIONAL TRANSONIC FACILITY FAN BLADE PREPREG MATERIAL CHARACTERIZATION TESTS
P. J. Klich, W. H. Richards, and E. L. Ahl, Jr. Jul. 1981 82 p refs
(NASA-TM-81800) Avail: NTIS HC A05/MF A01 CSCL 14B

The test program for the basic prepreg materials used in process development work and planned fabrication of the national transonic facility fan blade is presented. The basic prepreg materials and the design laminate are characterized at 89 K, room temperature, and 366 K. Characterization tests, test equipment, and test data are discussed. Material tests results in the warp direction are given for tensile, compressive, fatigue (tension-tension), interlaminar shear and thermal expansion.
E.A.K.

N81-31228*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A TIME LAG STUDY OF THE VERTICAL MOTION SIMULATOR COMPUTER SYSTEM
William B. Cleveland Aug. 1981 21 p refs
(NASA-TM-81306; A-8654) Avail: NTIS HC A02/MF A01 CSCL 14B

A study was performed to evaluate an experimental method to determine time lags in real-time computer systems as the one associated with the Vertical Motion Simulator at Ames Research Center. The approach was to use an ordinary frequency analyzer to measure the phase difference between inputs and outputs of the computer system. The various elements of the program and computational architecture were modeled. Various factors, such as computer frame time and input frequency, were varied so that they were representative of the operational use of the simulator facilities. Experimentally determined results were compared with predictions derived from the simulation models. The results indicate that the frequency analyzer can be readily used to evaluate time lags in systems of this type. Differences between predicted and measured phase values indicate that the hardware and software imparts a time lag of about 5 msec to this facility. Author

N81-31229*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC INSTABILITY STOPPERS FOR WIND-TUNNEL MODELS Patent Application
Robert V. Doggett, Jr. and Rodney H. Ricketts, inventors (to NASA) Filed 17 Jun. 1981 11 p
(NASA-Case-LAR-12720-1; US-Patent-Appl-SN-274706) Avail: NTIS HC A02/MF A01 CSCL 14B

A mechanism for diverting the flow in a wind tunnel from the wing of a tested model is described. The wing is mounted on the wall of a tunnel. A diverter plate is pivotally mounted on the tunnel wall ahead of the model. An actuator fixed to the tunnel is pivotably connected to the diverter plate, by plunger. When the model is about to become unstable during the test the actuator moves the diverter plate from the tunnel wall to divert flow about the wing and change the effective sweep angle thereof maintaining stable model conditions. The diverter plate is then retracted to enable normal flow. NASA

N81-31230*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC INSTABILITY STOPPERS FOR WIND-TUNNEL MODELS Patent Application
Robert V. Doggett, Jr. and Rodney H. Ricketts, inventors (to NASA) Filed 17 Jun. 1981 10 p
(NASA-Case-LAR-12458-1; US-Patent-Appl-SN-274705) Avail: NTIS HC A02/MF A01 CSCL 14B

A mechanism for constraining models or sections thereof, was wind tunnel tested, deployed at the onset of aeroelastic instability, to forestall destructive vibrations in the model is described. The mechanism includes a pair of arms pivoted to the tunnel wall and straddling the model. Rollers on the ends of the arms contact the model, and are pulled together against the model by a spring stretched between the arms. An actuator mechanism swings the arms into place and back as desired.
NASA

N81-31231# Committee on Commerce, Science, and Transportation (U. S. Senate).
AIRPORT AND AIRWAY SYSTEM DEVELOPMENT ACT OF 1981
Washington GPO 1981 280 p Hearings on S. 508 before the Subcomm. on Aviation of the Comm. on Com., Sci., and Transportation, 97th Congr., 1st Sess., 24-25 Feb. 1981
(GPO-75-804) Avail: Subcommittee on Aviation

Legislation intended to provide for the improvement of the nation's airport and airway system is addressed. Airport development in the areas of facilities and equipment and research, engineering, and development is discussed. Safety factors are emphasized. Programs and policies which will increase the productivity of the nation, reduce government participation and

involvement in regulatory matters, improve aviation safety, and maintain a strong air transportation system are proposed. J.M.S.

N81-31232# Naval Training Equipment Center, Orlando, Fla.
THE EFFECTS OF VARIOUS FIDELITY FACTORS ON SIMULATED HELICOPTER HOVER Final Report, Mar. 1979 - Jun. 1980
G. L. Ricard, R. V. Parrish, B. R. Ashworth, and M. D. Wells Jan. 1981 72 p refs
(AD-A102028; NAVTRAEQUIPC-IH-321) Avail: NTIS HC A04/MF A01 CSCL 05/9

The effects of the cues of aircraft motion, of delays in a visual scene, and of movement of a ship model were examined by measuring pilots' ability to hover a simulated helicopter near a destroyer class ship. Fourteen Navy helicopter pilots were tested in a within subjects, factorial combination of fixed base, moving base, and g-seat conditions where delays of approximately 66 or 128 milliseconds existed in the simulator's visual display, and the pilots were to hover near a moving or stationary ship. In addition, an effort was made to determine the effect a head-up display of aircraft position had on the measures of control. Best performance was seen with the moving base simulation while poorest control was associated with the fixed-base conditions and in-between performance was measured under the g-seat conditions. The addition of the longer delay uniformly elevated scores, but movement of the ship model had little effect. Also performance was not affected by removal of the head-up display. A recommendation is made for the configuration of trainers for aircrews of marginally stable vehicles. This is that motion cuing is likely to be useful for flight regimes such as hover, and that currently platform technology is the recommended source of these cues. Author (GRA)

N81-31233# Naval Ship Research and Development Center, Annapolis, Md. Surface Ship Structures Div.
STRUCTURAL RESPONSE METHODS AND EVALUATION RESULTS FOR HELICOPTER LANDING DECKS ON 210- AND 270-FOOT USCCG CUTTERS Final Report, 1977 - 1980
M. O. Critchfield, J. L. Rodd, and W. H. Hay Jul. 1981 129 p refs
(Contract MIPR-Z-70099-6-65439)
(AD-A102420; DTNSRDC-81/009) Avail: NTIS HC A07/MF A01 CSCL 13/10

Since 1976, the David W. Taylor Naval Ship Research and Development Center has been assisting the U.S. Coast Guard in evaluating the strength of several helicopter landing deck configurations for existing 210-foot long cutters and for the new 270-foot cutters. These evaluations were performed based on a combined program of (a) analytical, (b) one-fifth-scale rigid vinyl model, and (c) full-scale investigations for several landing gear load conditions, including the main and tail wheels on the U.S. Navy LAMPS Helicopter. The analytical side of the program included: framing analyses using the finite-element method and other techniques; nonlinear, large-deflection analyses of the deck plating; and web bending analyses in the stiffeners. The web bending stresses referred to here are associated with local out-of-plane bending of the web due to a rotation of the joint between the stiffener web and the deck plating. These web stresses are distinct from those related to ordinary bending of the stiffener in the vertical plane. Web bending stresses in the stiffeners were first observed in full-scale tests on the 210-foot cutter STEADFAST and are not specifically addressed by current design procedures. A one-fifth-scale rigid vinyl model was used to validate the analytical procedures and also to investigate such considerations as load placement, orientation, and tire print geometry. GRA

N81-31234# Dayton Univ., Ohio. School of Engineering.
BIOCONAID SYSTEM (BIONIC CONTROL OF ACCELERATION INDUCED DIMMING) Final Report
Dana B. Rogers, David L. Quam, Jack G. Crouch, and Andrew Higgins Jul. 1981 110 p refs
(Contract F33615-77-C-0080; AF Proj. 6114)
(AD-A102510; AFHRL-TR-81-3) Avail: NTIS HC A06/MF A01 CSCL 05/9

The BIOCONAID System represents the development of a new technique for enhancing the fidelity of flight simulators during high acceleration maneuvers. This technique forces the simulator pilot into active participation and energy expenditure similar to the aircraft pilot undergoing actual accelerations. The system consists of an electromyographic (EMG) subsystem and the software implementation of four physiological models: Cardiovascular Model; G-Suit Model; Straining Model, and Visual Field Model. The EMG subsystem is required for signal processing of muscular straining signals used in the Straining Model. The EMG subsystem and all software except the Visual Field Model have been carefully checked-out to yield results consistent with experimental data and known physiology. Consequently, the BIOCONAID System has the potential of providing a very realistic simulation of visual dimming with straining during high accelerations. It is recommended that the system be implemented and evaluated in an Air Force simulator with experienced pilots. Author (GRA)

N81-31235# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
FLIGHT SIMULATOR: USE OF SPACEGRAPH DISPLAY IN AN INSTRUCTOR/OPERATOR STATION Final Report
Lawrence D. Sher Jul. 1981 34 p
(Contract F33615-79-C-0013; AF Proj. 6114)
(AD-A101951; AFHRL-TR-80-60) Avail: NTIS HC A03/MF A01 CSCL 05/9

SpaceGraph is described as a new computer-driven display technology capable of showing space-filling images, i.e., images that are truly three-dimensional. This report details the findings on how this new technology can be used in, and in conjunction with, the Instructor/Operator Station (IOS) of a flight simulator. In current practice, the location, altitude, and flight attitude of a simulated aircraft are graphically shown to the instructor/operator on flat screens. This dimensionally-mismatched form of data presentation creates a greater workload on the instructor/operator who must integrate several flat presentations into a mental construct of performance in three-dimensional space. Such space-filling data should be shown with a space-filling display, now that one exists. Unexpectedly, student pilots were also able to use the display directly. As a training aid intermediate between 'flying' one's hands in the classroom and 'flying' the big simulators, it would appear to be a new kind of low-cost, part-task training vehicle. It offers the realism of computer-produced flight dynamics but with a view of the aircraft rather than out of the aircraft. Author (GRA)

N81-31236# Civil Aeronautics Board, Washington, D.C.
AIRPORT ACTIVITY STATISTICS OF CERTIFICATED ROUTE AIR CARRIERS Annual Report
31 Dec. 1980 345 p Prepared jointly with FAA
(AD-A102355) Avail: NTIS HC A15/MF A01 CSCL 01/2

This report furnishes airport activity of the Certificated Route Air Carriers. Tabulated data includes: passenger enplanements, tons of enplaned freight, express, and mail. Both scheduled and non-scheduled service, and domestic and international operations are included. These data are shown by airport and carrier. Another table includes departures by airport, carrier and type of operation, and type of aircraft. GRA

N81-31237# Missouri Univ. -Rolla. Graduate Center for Cloud Physics Research.
CONSTRUCTION OF FULL SIZE CLOUD SIMULATION CHAMBER Progress Report, 1 Jan. - 30 Jun. 1981
Daniel R. White Jun. 1981 18 p refs
(Contract F49620-80-C-0090; AF Proj. 2310)
(AD-A101836) Avail: NTIS HC A02/MF A01 CSCL 14/2

Work on construction of the full size cooled wall cloud simulation chamber has been pursued in three main areas. The mechanical construction has begun the assembly of the small Proto II chamber and started machining of the major components of the large Romulus chamber. The study of the temperature uniformity over the surface of the inner wall plates was completed. The design problem with the primary chamber sealing gaskets was solved. The optical table and tower for the Romulus chamber were purchased and set up for testing. Also a preliminary design for an actively cooled window port was developed. Construction of the switching power supplies, and development of the control systems for the thermoelectric modules used for wall temperature control was initiated. Drift problems with the transistor thermometers were traced to changes in manufacturers'

procedures and corrective measures were taken to solve the problem. Author (GRA)

N81-31238# Systems Control, Inc., West Palm Beach, Fla. Champlain Technology Industries Div.
NATIONAL ICING FACILITIES REQUIREMENTS INVESTIGATION Final Report, 16 Dec. 1980 - 1 May 1981
F. R. Taylor and R. J. Adams Jun. 1981 151 p refs (Contract DTFA01-80-C-10080)
(AD-A102520; FAA-CT-81-35) Avail: NTIS HC A08/MF A01 CSCL 14/2

An analysis of National Icing Facilities requirements was performed at the request of the Federal Aviation Administration. This effort consisted of a five-month investigation to determine the scope and character of current and future icing facilities needs. This investigation included current aircraft needs as well as facilities that might be required for icing research, developing and certification testing through the year 2000. The information used for this study included all icing certification regulations for both fixed wing airplanes and rotorcraft. These regulatory requirements for icing certification were supplemented by a comprehensive analysis of current and future aircraft operational requirements. This independent facility requirements assessment was then compared to a previously published NASA review of icing facilities capabilities. The conclusion was reached that the need for an inventory of National Icing Facilities currently exists and will become intensified in the next decade. The technical characteristics of these facilities were described and it was recommended that a joint FAA/NASA/DOD Task Force be established to formulate and spearhead the development of a National Icing Facilities Program. Author (GRA)

N81-31108# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.
REVIEW OF TECHNIQUES FOR DETERMINATION OF DYNAMIC STABILITY PARAMETERS IN WIND TUNNELS
K. J. Orlik-Rueckemann *In* AGARD Dyn. Stability Parameters May 1981 28 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31109# National Aeronautical Establishment, Ottawa (Ontario). Unsteady Aerodynamics Lab.
DIRECT FORCED-OSCILLATION TECHNIQUES FOR THE DETERMINATION OF STABILITY DERIVATIVES IN WIND TUNNELS
E. S. Hanff *In* AGARD Dyn. Stability Parameters May 1981 23 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31110# Royal Aircraft Establishment, Bedford (England). Dept. of Aerodynamics.
WIND-TUNNEL MEASUREMENT OF AERODYNAMIC DERIVATIVES USING FLEXIBLE-STING RIGS
C. O. OLeary *In* AGARD Dyn. Stability Parameters May 1981 15 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31111*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROTARY AND MAGNUS BALANCES
Gerald N. Malcolm *In* AGARD Dyn. Stability Parameters May 1981 26 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01A

N81-31113# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SUPPORT INTERFERENCE
L. E. Ericsson *In* AGARD Dyn. Stability Parameters May 1981 26 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

N81-31131*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE NATIONAL TRANSONIC FACILITY: REVIEW AND STATUS REPORT
Robert R. Howell *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 1-24 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31132*# National Aeronautics and Space Administration, Washington, D. C.
THE NTF AS A NATIONAL FACILITY
Clinton E. Brown *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 25-28 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31133*# Office of the Under Secretary of Defense for Research and Engineering, Washington, D. C.
NTF AND THE DEPARTMENT OF DEFENSE
Raymond F. Siewert *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 29-30 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31134*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NTF MANAGEMENT CONSIDERATIONS
Robert E. Bower *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 31-36 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION SYSTEMS FOR THE NATIONAL TRANSONIC FACILITY
Joseph F. Guarino *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 75-80 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31138*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTRUMENTATION FOR CALIBRATION AND CONTROL OF A CONTINUOUS-FLOW CRYOGENIC TUNNEL
Charles L. Ladson and Robert A. Kilgore *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 81-91 refs Presented at the AGARD-VKI Lecture Series 3 on Cryogenic Wind Tunnels, Rhode-Saint-Genese, Belgium, 19-23 May 1980 and Hampton, Va., 27-30 May 1980 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ONSET OF CONDENSATION EFFECTS IN CRYOGENIC WIND TUNNELS
Robert M. Hall *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 93-104 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31140*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW QUALITY MEASUREMENTS IN TRANSONIC WIND TUNNELS AND PLANNED CALIBRATION OF THE NATIONAL TRANSONIC FACILITY
P. Calvin Stainback and Dennis E. Fuller *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 105-121 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

N81-31145*# Douglas Aircraft Co., Inc., Long Beach, Calif. Wind Tunnel Test and Development.
PRELIMINARY USER PLANNING FOR THE NASA NATIONAL TRANSONIC FACILITY
J. D. Cadwell *In* NASA. Langley Research Center High Reynolds Number Res. - 1980 Sep. 1981 p 163-167 (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N81-31239*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: SOLAR MESOSPHERE EXPLORER (SME)
[1981] 33 p
(NASA-TM-84013; S-887-81-01) Avail: NTIS HC A03/MF A01 CSCL 22A

The nature and magnitude of changes in the mesospheric ozone densities that result from changes in the solar ultraviolet flux and the interrelationship between ozone and water vapor and its photodissociation products in the mesosphere and between ozone, water vapor, and nitrogen dioxide in the upper stratosphere can be studied using five instrument packages carried on the solar mesosphere explorer satellite. The satellite configuration consists of an observatory module and a spacecraft bus which houses five instrument packages. The launch vehicle and the characteristics of the instruments are described. A mission profile is included with launching windows. The first of the OSCAR series spacecraft is being flown as a secondary payload. This amateur radio satellite from the University of Surrey is described as well as its mission objectives. A.R.H.

N81-31240# Committee on Science and Technology (U. S. House).
UNITED STATES AND SOVIET PROGRESS IN SPACE: SUMMARY DATA THROUGH 1979 AND A FORWARD LOOK
Charles S. Sheldon, II Washington GPO 1980 98 p Presented to the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., Apr. 1980 Prepared by the Congressional Research Service, Library of Congress
(GPO-59-476) Avail: SOD HC

Both the U.S. and the Soviets have large, comprehensive space programs competing across a broad spectrum of military applications, civil applications, orbital science, and space exploration. The Soviet program is the larger of the two, but who is ahead involves complex qualitative judgments. Progress made by both countries in the past twenty-two years is summarized and aspects of the two programs are discussed from the viewpoints of supporting resources for space flight; manned flight; military vs civilian space activities, space applications flights (communications; weather reporting; navigation and control; geodesy and mapping; and Earth resources); and lunar and planetary exploration. Future directions explored include space shuttle and its implications for each country; interest in lunar landing; competition in space applications, and the possibilities for joint efforts. Tables show successes amd failures in spacecraft launchings, space firsts, manned space flights, and payloads by mission (1957-1979). A.R.H.

N81-31241# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
SPACELAB UTILIZATION: MATERIALS RESEARCH AND PROCESSING TECHNOLOGY IN SPACE [SPACELAB-NUTZUNG: WERKSTOFFORSCHUNG UND VERFAHRENS-TECHNIK IM WELTRAUM]
1980 351 p refs In GERMAN; In GERMAN; ENGLISH summary Presented at Status-Sem. 1980 des Bundesministerium fuer Forschung und Technologie, Wuerzburg im Ramen, West Germany, 16-18 Sep. 1980
(DGLR-80-02; ISBN-3-922010-18-0) Avail: NTIS HC A16/MF A01

The progress in the definition and design of space experiments is reviewed and an assessment of their practicability as Spacelab experiments is given. Research areas covered included: (1) physical chemistry and processing technology, with particular emphasis on hardware development and space flight compatibility; (2) metals and binding materials research, mainly dealing with boundary layer and transport phenomena at solidification fronts; (3) monocrystal growth technology, concentrating on materials analysis and development of crystallization chambers; and (4) boundary layer and transport phenomena research, with contributions on reaction kinetics and convection in crystal melts. A summary of the global German space program is also included. For individual titles, see N81-31242 through N81-31265.

N81-31242# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
CURRENT PROBLEMS IN THE GERMAN PROGRAM ON MATERIALS RESEARCH AND PROCESSING TECHNOLOGY IN SPACE [AKTUELLE FRAGEN DES DEUTSCHEN PROGRAMMS 'WERKSTOFFORSCHUNG UND VERFAHRENSTECHNIK IM WELTRAUM']
G. Greger *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 9-19 In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The aims, organization, underlying concept and strategy of the program are reviewed. Delays in the space shuttle program and frequent changes in Spacelab systems requirements are identified as a major concern, posing problems of research continuity, financing and reliability. The relative merits of Spacelab experiments and fully automated experiments (MAUS) as regards coping with these problems are discussed. The corresponsability of the user during all phases of the program is indicated to be essential and should be further defined. The progress and evolution in the main research areas (physical chemistry, materials science, crystal growth, and transport processes) is reviewed. The importance of deepening interdisciplinary collaboration and global coordination is stressed. Author (ESA)

N81-31243# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
PROJECTS AND PLANS OF THE GERMAN PROGRAM ON MATERIALS RESEARCH AND PROCESSING TECHNOLOGY IN SPACE [PROJEKTE UND VORHABEN DES DEUTSCHEN PROGRAMMS: WERKSTOFFORSCHUNG UND VERFAHRENSTECHNIK IM WELTRAUM]
H. S. Anton and N. Kiehne *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 21-35 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The status and preliminary results of various German projects that are either planned or under way are discussed: (1) materials laboratory for the first Spacelab mission; (2) technological experiments under zero gravity (TEXUS); (3) materials science autonomous experiments under zero gravity (MAUS); (4) the shuttle pallet satellite project (SPAS), defining a family of space platforms; and (5) D1-mission, an all German flight for chemical, physical and biomedical applications. Individual experimental designs are considered and the payload configurations of the different projects are shown. A comparison of the German program and its financial implications with that of other organizations or countries is appended. Author (ESA)

N81-31244# Mainz Univ. (West Germany). Physiologisches Inst. der Johannes-Gutenberg.
SPACE LIFE SCIENCES
Rudolf vonBaumgarten *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 37-43 In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The nature and aims of space life sciences research are reviewed, and experiments foreseen for the German D1-mission are described. Space life science is shown to be a multidisciplinary science characterized by applied, operational aspects while at the same time giving way to basic research connected with weightlessness. The proposed experiments are: (1) acceleration studies on a space sledge in order to study hallucinations, space illness and caloric nystagmus; (2) modification in bloodstream under zero gravity and monitoring of hormone production and central vein pressure; (3) measurement of the inner pressure of the eye; (4) radiation effects on bacteria and biomolecules; and (5) development of a biorack for cell research under reduced gravity. Author (ESA)

N81-31245# Technische Univ., Berlin (West Germany). Inst. fuer Chemieingenieurtechnik.
PERFORMING EXPERIMENTS UNDER SPACE FLIGHT CONDITIONS IN THE DOMAIN OF CHEMICAL ENGINEER-

ING [EXPERIMENTIEREN UNTER WELTRAUMBEDINGUNGEN IM BEREICH DER CHEMIEINGENIEURTECHNIK]
H. Brauer *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Spacelab 1980 p 49-83 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The forces prevailing in processing technology, such as gravity, inertia, surface and interface tension, centrifugal force, and friction are reviewed. A correct understanding of these forces and or their interplay is shown to be essential for the design of experiments under reduced gravity. The rest gravity acceleration under Spacelab flight conditions is studied. A description of the expected outcome of a number of zero gravity experiments is given to illustrate the basic ideas: (1) behavior of a liquid subject to acceleration along straight or curved trajectories; (2) bubble creation and motion; (3) two phase flows in ducts; (4) behavior of liquids in capillaries; and (5) oxygen supply to a candle flame. For comparison, the evolution of the same experiment with gravity is also described. Author (ESA)

N81-31246# Bayer A.G., Dormagen (West Germany).
DEVELOPMENT OF AN AUTONOMOUS EXPERIMENT ON THE MEASUREMENT OF FRICTION LOSSES OF PNEUMATIC TRANSPORT UNDER REDUCED GRAVITY [ENTWICKLUNG EINES AUTONOMEN EXPERIMENTES FUER MESSUNG DER REIBUNGSVERLUSTE BEI DER PNEUMATISCHEN FOERDERUNG UNTER BEDINGUNGEN DER SCHWERELOSIGKEIT]
E. Muschelknautz and F. Nemecek *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 85-93 In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The status of a proposed Spacelab experiment aiming at a parametric study of the friction losses with respect to transport conditions, material properties of ducts and transported particles and the effects of gravity is given. The results of laboratory experimemts are shown in a global friction loss diagram which will be completed by the space experiment. The experimental design is considered, including the mounting of the experimentation platform in the bay of a space shuttle orbiter. The experience gained during the project definition phase in design optimization, manufacturing, automation, diagnostics and collaboration with space firms is reviewed. The necessity of an early determination of a common stategy of all parties concerned is stressed. The onset of the experiment is foreseen for the SPAS-01 flight of mid 1982. Author (ESA)

N81-31247# Technische Universitaet, Munich (West Germany). Lehrstuhl A fuer Thermodynamik.
BUBBLE CREATION AND HEAT TRANSFER UNDER ONE-GRAVITY AND MICRO-GRAVITY CONDITIONS [BLASENBILDUNG UND WAERMEUEBERGANG UNTER 1-G- UND MICRO-GBEDINGUNGEN]
J. Straub and A. Weinzierl *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 95-101 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The differences with respect to the dynamics of vapor phase growth and the heat transfer from a hot surface between Earth conditions and a micro-g environment are theoretically examined. The results indicate that no substantial difference should occur in the germ formation. The bubble formation, however, is shown to occur more slowly and evenly, giving rise to larger bubbles. Heat transfer is shown to depend on g to the power one fourth, resulting in heat transport by conduction only under microgravity conditions. An experiment conducted at $g = 1$ and $g = 0.4$ is shown to substantiate the theoretical predictions. Author (ESA)

N81-31248# Ruhr Univ., Bochum (West Germany). Lehrstuhl fuer Physikalische Chemie 2.
KINETICS OF PHASE SEPARATION IN FLUID MIXTURES [KINETIK DER PHASENTRENNUNG IN FLUESSIGEN MISCHSYSTEMEN]
G. M. Schneider, M. Dittmann, and J. Wenzel *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 103-106 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

An experimental program is proposed to investigate whether reduced gravity affects the kinetics of the formation of a second fluid phase from an homogeneous nonelectrolytic mixture. Emphasis is placed on whether or not droplet growth is gravity induced or if it stems from an energetic balancing of bulk and surface properties. A pressure jump separation cell is described and the separation technique explained. This system is shown to have distinct advantages over temperature jump methods. The test mixture is 2-butoxyethanol and water. It is shown, however, that reduced gravity conditions can be simulated by using isopycnic systems. The diagnostic apparatus and the experimentation procedure are explained. Author (ESA)

N81-31249# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Technisch-Chemisch Lab.
GAS BUBBLE FORMATION IN ELECTROLYTES UNDER REDUCED GRAVITY [GASBLASEN BEI DER ELEKTROLYSE UNTER REDUZIERTER SCHWERKRAFT]
N. Ibl, O. Dossenbach, J. Raub (Forschungsinst. fuer Edelmetalle und Metallchemie), and O. Loebich (Forschungsinst. fuer Edelmetalle und Metallchemie) *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 107-110 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

A spaceflight experiment designed to study bubble growth and separation at electrodes in the absence of buoyancy is described. Transport processes, specific resistivity and energy consumption of electrolysis are among the factors studied. Experiments with pulsed currents are advocated for controlling the reaction rates of germ formation and growth in a wide range and for creating large supersaturations. A first phase foresees the monitoring of H_2 bubble growth from a sodium sulfate electrolyte by means of a high speed camera. A second phase aims at checking the existence of charge build-up on the bubbles. Preformed craters in the electrode surface are expected to control the germ formation. The experiment is foreseen for phase four of the TEXUS program. Author (ESA)

N81-31250# Technische Univ., Berlin (West Germany). Inst. fuer Chemieingenieurtechnik.
DEVELOPMENT OF A MATTER EXCHANGER [ENTWICKLUNG EINER STOFFAUSTAUSCHMASCHINE]
H. Brauer and W. Gaebelein *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 111-127 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

A gas-liquid exchanger, designed to investigate the influence of gravity and centrifugal force on the flow of two phase systems, is described. Results are applicable to life support system technology and for absorption and desorption processes in chemical engineering. The operation of the exchanger is explained, including a description of the fluid motion, the dispersion process and the droplet motion. The layout of a test setup is given and results are shown on pressure loss, loss correction of two phase systems, transport capacity and energy consumption. The advantages of co- and counter- streaming systems are assessed and the former is proposed for usage in the projected spacelab experiment. Author (ESA)

N81-31251# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
MULTIPLE PURPOSE FACILITIES FOR MATERIALS SCIENCE EXPERIMENTS IN SPACE [MEHRZWECKANLAGEN FUER WERKSTOFFWISSENSCHAFTLICHE EXPERIMENTE IN WELTRAUM]
Rainer Jansen *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 133-140 In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

The facilities at the disposal of experimenters planning materials science investigations under reduced gravity within the German program are surveyed. These facilities fall in two main categories: heating facilities and optical diagnostic modules. Detailed technical data as well as typical applications are given on the heating facilities: (1) isothermal multiple chamber oven TEM01; (2) isothermal large chamber oven TEM02; (3) isothermal heating facility IHF; (4) gradient oven with temper facility GHF-Q; (5) gradient oven TEM03; (6) three zone gradient oven GHF;

(7) mirror heating facility MHF; and (8) mirror and gradient heating facility ELLI. The optics modules comprise the space optics laboratory and the optical module TEMO6. Both allow visualization and measurement of flow phenomena in transparent media and are constituted of many chambers with individual data processing and control systems. Two further systems are planned: a welding module for arc welding, and a precision thermostat for thermal and caloric measurements. Author (ESA)

N81-31252# Krupp (Fried.) G.m.b.H., Essen (West Germany). Krupp Forschungsinst.

TRAPPING OF DISCRETE PHASES AT SOLIDIFICATION FRONTS [DAS UMWACHSEN DISKRETER PHASEN AN ERSTARRUNGSFRONTEN]

Juergen Poetschke *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 141-168 refs In GERMAN; ENGLISH summary (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

The theory of suspended phases at the solidification front of metals is reviewed in support of a Spacelab experiment investigating the behavior of alumina particles in solidifying copper. Using the interfacial energies, the Van der Waal force is derived which is shown to either attract or repel the suspended particle with respect to the crystal. A kinetic study demonstrates that a plane solidification front behind the particle represents an accurate approximation provided the thermal conductivity and the dissolved impurities of the melt are low. The critical solidification rate is shown to be inversely proportional to the particle radius.

Author (ESA)

N81-31253# Battelle Inst., Frankfurt am Main (West Germany).

DEMONSTRATION OF THE SEPARATION BEHAVIOR OF ALLOYS USING TRANSPARENT MODEL SYSTEMS [DEMONSTRATION DES ENTMISCHUNGSVERHALTENS VON LEGIERUNGEN AN TRANSPARENTEN MODELLSYSTEMEN]

D. Langbein and Bernd Fuessl *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 169-174 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

Experimental results on the separation behavior of a methanol-cyclohexan mixture are given. This almost isopycnic system is chosen as an appropriate transparent model for studying separation of alloys under reduced gravity. Optical observations show that a liquid with smaller surface energy is capable of discarding another one with a larger energy from the surface, even when the latter is less dense. The similarity of this behavior with solidification phenomena of an aluminum-indium system in earlier space experiments is stressed. It is also demonstrated and theoretically explained that miscible concentrations of nonmiscible liquids possess boundary layer energy. Extrapolation to the separation of alloys is shown to be possible.

Author (ESA)

N81-31254# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Metallurgie und Metallkunde.

CONCENTRATION PROFILES IN FRONT OF SOLIDIFICATION FRONTS [KONZENTRATIONSPROFIL VOR ERSTARRUNGSFRONTEN]

H. M. Tensi, H. Fuchs, and P. F. Harmathy *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 175-202 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

The status of theory and experiments on the concentration behavior in a melt in front of a solidification front is reviewed in view of determining the diffusion coefficients characterizing the trapping in the crystal phase. Profiles are calculated for particle transport by diffusion, convection or a combination of both. Experimental results under 1-g conditions are shown for an Al-Cu mixture. An evaluation is made of the possible changes due to the freezing of the samples before their analysis. Further theoretical and experimental work is found to be necessary. The interference due to thermal convection and sedimentation points to the usefulness of reduced gravity experiments. Author (ESA)

N81-31255# Brown, Boveri und Cie, A.G., Heidelberg (West Germany). Zentrales Forschungslabor.

POROSITY OF WELDS [POROSITAET IN SCHWEISSNAEHTEN]

B. Jahnke *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 203-216 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

Reduced gravity conditions are shown to alter the degassing feasability of melts and the ensuing porosity properties of welds. The underlying processes reviewed and quantified include: solubility of gases in melts, transport processes in front of solidification fronts, and constitutional undercooling. The activation energy for bubble formation is derived and their kinetics is indicated to be dominated by the reaction rates of crystallization and bubble growth. Reduced gravity removes buoyancy and hydrostatic pressure, modifies the solidification phenomena through changing convection, and is shown to increase porosity. Experiments and measures designed to counteract this tendency suggested include: electron beam welding, external pressure increase, enhancement of solidification rates, creation of micro alloys, and decrease of interfacial tension. Author (ESA)

N81-31256# Freiburg Univ. (West Germany). Kristallographisches Inst.

SOLVENT ZONE CRYSTALLIZATION OF CdTe IN A MIRROR HEATING FACILITY [LOESUNGSZONENKRISTALLISATION VON CdTe IN DER SPIEGELHEIZANLAGE]

R. Dian, R. Schoenholz, and R. Nitsche *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 221-228 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

Results of a Cd Te monocrystal growth experiment using the travelling solvent (or heater) method are described. A variation of the solvent method was developed making use of prefabricated seed, solvent and matrix rods. The preparation of the growth ampule, the double ellipsoid mirror heating facility and the growth procedure are illustrated. The heater is of an original design characterized by small energy consumption, high temperature and acute focussing. Monocrystals up to 25 mm long were grown at 800 C with a zone height of 4 mm and travelling speeds from 3 to 17 mm/d. Successive steps in the growth process are illustrated. Author (ESA)

N81-31257# Stuttgart Univ. (West Germany). Physikalisches Inst.

MELTING-POT FREE PRODUCTION OF 3-5 SEMICONDUCTOR CRYSTALS IN A MIRROR OVEN [DIE TIEGELFREIE HERSTELLUNG VON 3-5 HALBLEITERKRISTALLEN IM SPIEGELOFEN]

Klaus-W. Benz and Gerhard Nagel *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 229-233 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

Preliminary results on GaSb crystal growth experiments with boundary-free solvent zones are presented. The design alleviates the main adverse wall effects, i.e., wall induced orientation changes, and crystal inhomogeneity. The two heating facilities (graphite oven and mirror oven), the containers and the growth technique are described. The gallium antimonide (GaSb) crystals up to 16 mm diameter were grown. Large diameters are shown only to be possible under reduced gravity. All crystals have good physical properties and are homogeneous over the whole volume. Further experiments are planned with GaAs, GaP and InP in preparation of space experiments. Author (ESA)

N81-31258# Freiburg Univ. (West Germany). Kristallographisches Inst.

CONSTRUCTION AND TEST OF A MONO-ELLIPSOID MIRROR HEATING FACILITY [BAU UND ERPROBUNG EINER MONOELLIPSOIDSPIEGELHEIZANLAGE]

A. Eyer, H. Leiste, M. Schumacher, and H. Walcher *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 235-248 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

A mirror oven reaching 1400 C using one ellipsoid and

achieving a 25% energy saving and perfect rotational symmetry is described. Ready reconversion in gradient oven and easy adaptation for crystal growth zone experiments with or without wall contact are among the factors discussed. Theoretical calculations on the optimization of the radiation distribution are presented. The mounting in an experimentation rack is illustrated. Comparative measurements of temperature, temperature distribution, and energy consumption of four ellipsoid configurations and two halogen lamps are given. Theory and experiments indicate the advantages of using almost spherical ellipsoids having half axes that are as large as possible. Author (ESA)

N81-31259# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaften 6.

RESULTS OF EXPERIMENTS ON DIRECTIONAL SOLIDIFICATION OF THE InSb-NiSb EUTECTIC IN THE GRADIENT HEATING FACILITY OF CNES, TOULOUSE. DRAFT OF A CHARACTERIZING PROGRAM FOR EUTECTIC PROBES [ERGEBNISSE VON EXPERIMENTEN ZUR GERICHTETEN ERSTARRUNG DES InSb-NiSb EUTEKTIKUMS IM GRADIENTENOFEN (G.H.F.) BEI CNES, TOULOUSE. AUFSTELLUNG EINES CHARAKTERISIERUNGSPROGRAMMES FUER EUTEKTISCHE PROBEN]

Peter Kyr and Georg Mueller *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 249-263 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

Results on growth and structure analysis on InSb-NiSb eutectic crystals produced by directional solidification are presented. By means of a triple tube gradient oven, growth characteristics, such as temperature gradients in melt and crystal, phase boundary form and growth rate of three different probe configurations, were measured. Technical data on the different probes are included and it is shown that minor changes in the configuration lead to important differences in thermal behavior. The quality of the eutectic structure is determined by resistance measurement in a magnetic field and numerical analysis of microscope prints of etched cuts lying both perpendicular and parallel to the growth direction. The numerical procedure is explained and typical prints are shown. The reliability of the methods might lead to the drafting of an analysis standard.
Author (ESA)

N81-31260# Max-Planck-Institut fuer Metallforschung, Stuttgart (West Germany). Inst. fuer Werkstoffwissenschaften.

GROWTH OF BERYLLIUM MONOCRYSTALS FOR NEUTRON MONOCHROMATORS [ZUECHTUNG VON BERYLLIUM-EINKRISTALLEN FUER NEUTRONEN-MONOCHROMATOREN]

Sigurd Joensson *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 265-283 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

Growth experiments of beryllium monocrystals are discussed in support of a planned Spacelab experiment in which monochromator grade crystals, dispersed with beryllium oxide, will be grown. Melting-pot free zone melting in an inductively heated crystallization chamber and in a double ellipsoid mirror even is described and its hardware illustrated. The properties of the crystals were analyzed by etching, electron microscopy, X-ray analysis, Laue method and neutron diffraction. The measured density and distribution of defects is shown to strongly depend on the number of zone transits and on the location in the crystal. The presence of several subgrains, leading to a splitting of the neutron rocking-curves, is observed. As subgrain free crystals are indispensable for monochromator application an intensification of the program is judged unavoidable. Author (ESA)

N81-31261# Freiburg Univ. (West Germany). Chemisches Lab.

BIOCHEMICAL PREPARATORY AND ANALYTICAL DEVELOPMENTS AND PLANS IN CONNECTION WITH THE SPACELAB PROGRAMS [BIOCHEMISCH PRAEPARATIVE UND ANALYTISCHE NEU- UND WEITERENTWICKLUNGEN IM RAHMEN DES SPACELAB- PROGRAMMS]

Chr. John Littke and W. Littke *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 285-300 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

Methods for fast production of large quantities of pure beta-Galactosidase are discussed. By their application, protein crystal growth under space conditions can start from fresh material even if flight schedules are unpredictable. It is proposed to extract beta-Galactosidase from the cell substance of E. coli bacteria by fixing it by a specific inhibitor from which it is then separated by centrifugal action or by ion exchanging. The procedure is based on the substratum splitting properties of the enzyme. Appropriate inhibitors, fixing substances and ion exchangers are indicated. A new procedure for continuous disk electrophoresis, used to check the purity of the proteins, is described and its superiority with respect to earlier systems is demonstrated. Author (ESA)

N81-31262# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.

PROCESS CHAMBER: HEAT CONDUCTION, DIFFUSION, CONVECTION, REACTION KINETICS, SURFACES AND WETTABILITY UNDER REDUCED GRAVITY [PROZESSKAMMER WAERMELEITUNG, DIFFUSION, KONVERKTION, REAKTIONSKINETIK, OBERFLAECHEN UND BENETZUNG BEI VERMINDERTER GRAVITATION]

H. Oertel and R. Kessler *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 305-322 refs In GERMAN (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

Basic fluid mechanical and physical processes are discussed which govern the preparation and execution of materials science experiments under reduced gravity. The Spacelab process chamber containing the space optics laboratory is described in which optical measurements of transparent media are carried out. The analysis shows that heat conduction measurements at low Prandtl number, diffusion at low Schmidt number, Marangoni instabilities, g-jitter convection, thermoacoustic instabilities, reaction kinetics in diffusion flames, surface phenomena, and kinetics of wettability are of prime importance in the space laboratory. These various processes are reviewed, characteristic parameters recalled, examples of their occurrence shown, and appropriate diagnostic methods are discussed. Active participation of payload experts is judged to be indispensable. Author (ESA)

N81-31263# Giessen Univ. (West Germany). Physikalisches Inst. der Justus-Liebig.

CONVECTION IN A FLOATING ZONE WITHOUT ROTATION [KONVEKTION IN EINER FLOATING ZONE OHNE ROTATION]

D. Schwabe, F. Preisser, and A. Scharmann *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 323-334 refs In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie (For primary document see N81-31241 22-12)
Avail: NTIS HC A16/MF A01

Results of laboratory and ballistic experiments on floating zone transport by Marangoni convection (MC) or natural convection (NC) are discussed. Their effects were separated in the Earth laboratory by suppressing MC by surface pollution. Flow patterns and temperature distributions are discussed and interpreted. Marangoni Convection is shown to dominate in zones with small diameters. In larger diameter experiments, MC is observed near the free boundary and NC in the bulk. The extrapolation from the NaN03 melts used in real crystal growth situations is discussed. Experimental setup and diagnostic techniques are given. Ballistic experiments in the TEXUS 3a rocket demonstrated the existence od oscillatory MC independent of direction and strength of gravity. It is concluded that the critical Marangoni number is smaller under microgravity than for standard gravity conditions. Author (ESA)

N81-31264# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.

MARANGONI CONVECTION IN A ROTATING MELTING ZONE [MARANGONIKONVEKTION IN EINER ROTIERENDEN SCHMELZZONE]

C.-H. Chun *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1981 p 335-346 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

The transition from pure Marangoni convection (MC) to dominant rotation flow in the floating zone of a crystal melt is analyzed. As such, the conditions for stationary convection, mandatory for the production of homogeneous crystals, can be determined. Dimensionless numbers in stationary and rotating coordinate systems are deduced and the interaction parameters between rotating flow and MC are defined. The ratio of the Reynolds numbers pertaining to the two flow types is shown to be the prime transition parameter. Flow distributions in the transition domain provoked by coaxial disks rotating alone or in the same direction and with superimposed MC are reproduced and discussed. Suppression of oscillatory MC by rotation is demonstrated. Author (ESA)

N81-31265# Technische Universitaet, Clausthal-Zellerfeld (West Germany). Arbeitsgruppe Glas.

REACTION KINETICS IN MOLTEN GLASSES [REAKTIONSKINETIK IN GLASSCHMELZEN]

M. Braedt and G. H. Frischat *In* DGLR Spacelab Utilization: Mater. Res. and Processing Technol. in Space 1980 p 347-351 refs In GERMAN (For primary document see N81-31241 22-12)

Avail: NTIS HC A16/MF A01

The transport processes in glass melts are reviewed in support of a projected Spacelab experiment on the interdiffusion in alkali silicate melts. Definite answers are expected on the respective relevance of solid state or fluid diffusive transport phenomena by experimenting under convection free conditions. Transport mechanisms in molten glasses are listed and the pertinent self diffusion and interdiffusion coefficients are defined. The temperature dependence of these coefficients is shown to be intermediate between that of solids and fluids. Tracer diffusion and resistivity measurements are indicated as appropriate diagnostics for investigating the transport mechanisms and for establishing the structure of polyanionic melts. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N81-31266# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

ORBITAL DECAY IN A DYNAMIC ATMOSPHERE

J. deLafontaine Dec. 1979 149 p refs

(UTIAS-244; ISSN-0082-5255) Avail: NTIS HC A07/MF A01

After a brief review of the field, the pertinent elements of the lifetime prediction problem are assembled. A quite complete model of the atmosphere is constructed which includes all the important dynamic effects, and which possesses several novel features. The equations of motion for the satellite are then presented together with a discussion of methods for their solution. The equations are first solved for the drag-only dispersions in a stationary atmosphere, and then, based on this foundation, more 'unified' solutions are derived due to the combined effects of air drag and Earth oblateness. Both circular and elliptical orbits are considered. T.M.

N81-31267# Royal Aircraft Establishment, Farnborough (England).

EVALUATION OF 15TH-ORDER HARMONICS IN THE GEOPOTENTIAL FROM ANALYSIS OF RESONANT ORBITS

D. G. King-Hele and Doreen M. C. Walker Jan. 1981 64 p refs

(RAE-TR-81006; RAE-SPACE-591; BR78550) Avail: NTIS HC A04/MF A01

The observed perturbations in 23 resonant orbits at various inclinations to the equator were used to determine the harmonic coefficients of order 15 and degree 15, 16, 17, ... 35. Analysis of the changes in orbital inclination on the 23 orbits gives the harmonics of odd degree, while those of even degree are found from the changes in eccentricity on 16 of the orbits. The coefficients of degrees 15, 16, 17, ... 23, should be more accurate than any previously obtained; their average standard deviation is 1.4 x 10 to the minus 9th power equivalent to 1 cm in geoid height. Comparisons with comprehensive Earth models showed the Goddard Earth Model 10B to be the best, and a standard deviation of about 3 x 10 to the minus 9th power in the GEM 10B 15th-order coefficients is indicated. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N81-31268# Naval Surface Weapons Center, White Oak, Md.

SPACE SHUTTLE RANGE SAFETY COMMAND DESTRUCT SYSTEM ANALYSIS AND VERIFICATION. PHASE 2: ORDNANCE OPTIONS FOR A SPACE SHUTTLE RANGE SAFETY COMMAND DESTRUCT SYSTEM Final Report

W. M. Hinckley, D. L. Lehto, N. L. Coleburn, A. J. Gorechlad, J. M. Ward, and J. Petes Mar. 1981 125 p refs

(AD-A102320; NSWC/TR-80-417) Avail: NTIS HC A06/MF A01 CSCL 19/1

External tank (ET) mounted command destruct system ordnance options were analyzed and judged on the basis of performance, cost, weight, development time, safety and ease of installation. A system using LSC's installed in the cable tray on the ET LOX/LH2 tanks was recommended. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N81-31269 Institut d'Aeronomie Spatiale de Belgique, Brussels.

LIFE AND DEATH OF ARTIFICIAL SATELLITES [VIE ET MORT DES SATELLITES]

J. Vercheval 1981 39 p In FRENCH; ENGLISH summary Submitted for publication

(Aeronomica-Acta-A-228-1981) Avail: Issuing Activity

The main characteristics of the orbital motion (anomalies) of artificial satellites are described. The perturbation forces which are discussed are: atmospheric friction, irregularities in the Earth gravitational field, lunar and solar perturbations, and solar radiation pressure. It is shown that the great diversity in orbital variations which have been observed is due to variations in satellite parameters, such as mass, effective cross section, initial orbit and geophysical conditions. The life of a satellite is closely related to these parameters. Examples are given, including perigee altitude evolution of Echo satellites. Author (ESA)

N81-31270 Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Space and Ballistic Systems Div.

SNIAS AND THE WORLD MARKET FOR APPLICATION SATELLITES

Francois Turck 1980 6 p Presented at INTELCOM, Rio de Janeiro, 19-23 May 1980

(SNIAS-802-422-106) Avail: NTIS HC A02

The program undertaken by Aerospatiale for the development of telecommunications and television broadcast satellites is reviewed. The current activities of the company are briefly described. The world market for applications satellites is discussed, with particular reference to the European Symphonie and Meteosat satellites. The Sonate, Duetto and Phebus satellite programs are also described, emphasizing the cooperative policy toward client countries. Author (ESA)

N81-31271*# Astro Research Corp., Carpinteria, Calif.

CONSIDERATIONS IN THE DESIGN OF LARGE SPACE STRUCTURES

John M. Hedgepeth, Richard H. MacNeal (MacNeal-Schwendler Corp., Los Angeles), Karl Knapp, and Charles S. MacGillivray Aug. 1981 230 p refs
(Contract NAS1-15347)
(NASA-CR-165744; ARC-TN-1101) Avail: NTIS HC A11/MF A01 CSCL 22B

Several analytical studies of topics relevant to the design of large space structures are presented. Topics covered are: the types and quantitative evaluation of the disturbances to which large Earth-oriented microwave reflectors would be subjected and the resulting attitude errors of such spacecraft; the influence of errors in the structural geometry of the performance of radiofrequency antennas; the effect of creasing on the flatness of tensioned reflector membrane surface; and an analysis of the statistics of damage to truss-type structures due to meteoroids. T.M.

N81-31272*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: SBS-B/DELTA LAUNCH
[1981] 22 p
(NASA-TM-84014; O-491-213-81-02) Avail: NTIS HC A02/MF A01 CSCL 22B

A prelaunch summary is presented for the Satellite Business Systems(SBS-B) communication satellite. The SBS-B spacecraft is capable of commercially transmitting point-to-point voice, data, facsimile, and telex messages within the continental United States as routine service in the 12/14 GHz (K-) Band. The spacecraft and launch vehicle are described along with the mission objectives. T.M.

N81-31273# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
EFFECTS OF MISSILE AND TARGET ACCELERATION PARAMETERS ON TIME-TO-GO ESTIMATION Final Technical Report, Jan. 1980 - Mar. 1981
Gordon K. F. Lee 31 May 1981 48 p refs
(Grant AF-AFOSR-0075-80)
(AD-A102091; AFOSR-81-0553TR) Avail: NTIS HC A03/MF A01 CSCL 17/7

The purpose of this research effort is to eliminate some of the existing assumptions of time-to-go estimation algorithms. The assumption of unlimited acceleration commands may be eliminated by incorporating boundary conditions on the control law. One may further compensate for system assumptions by applying a weighted functional to the time-to-go performance measure. Such extensions yield promising results. Author (GRA)

N81-31274# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
THE APL SATELLITE REFRIGERATOR PROGRAM
C. S. Leffel, Jr. and R. vonBriessen Jul. 1981 238 p refs
(Contracts N00017-72-C-4401; N00024-81-C-5301; ARPA Order 2307)
(AD-A102377; JHU/APL/TG-1332; QM-80-178) Avail: NTIS HC A11/MF A01 CSCL 13/1

Four satellite refrigerators were built and installed on a satellite to cool gamma ray spectrometers. The p-78-1 satellite, launched on February 24, 1979, was the first satellite to carry gamma ray detectors that were cooled by mechanical refrigerators. Still operating successfully after over 18 months in orbit, this is the first satellite experiment of any kind on which mechanical refrigerators have been operated for longer than a few weeks. This report describes the selection and specifications of the refrigerators as determined by APL and Lockheed, the design and construction of the refrigerators by Philips Laboratories, the design and construction of the motor drive and instrumentation electronics by APL, the APL qualification and acceptance test programs, and the APL laboratory life test program. The orbital performance of the refrigerators is discussed. GRA

N81-31275# Research Inst. of National Defence, Stockholm (Sweden).
A STUDY OF THE CONTROL PRINCIPLES OF REMOTELY CONTROLLED LV AIR DEFENSE MISSILES [STUDIE AV STYPRINCIPER HOS KOMMANDOSTYRDA LV-ROBOTAR]
Thomas Gundmark Jan. 1980 41 p In SWEDISH
(FOA-C-30180-E3) Avail: NTIS HC A03/MF A01

Missile guidance with a certain amount of lateral lead is described. In theory this can be varied from pure collimation guidance to ideal guidance towards an impact point through the variation of a guidance constant from 0 to 1. How the variation of this constant influences pertinent properties, such as area coverage, loading factor demand, etc., among various missile types with different speed profiles is investigated. It is shown that the influence of the guidance constant on the area of coverage is modest. Likewise, the influence on missile capability of hitting maneuvering targets is slight. Not unexpectedly, it appears that a missile's acceleration requirement diminishes with increasing values of the guidance constant. Thus, it can be stated that this method of guidance is more interesting from the viewpoint of dimension rather than tactics. J.M.S.

N81-31123# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
APPLICATION TO MISSILE DYNAMICS
C. P. Schneider *In* AGARD Dyn. Stability Parameters May 1981 11 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N81-31276*# National Aeronautics and Space Administration, Washington, D. C.
SPACE SHUTTLE NEWS REFERENCE
[1981] 282 p refs
(NASA-TM-82290) Avail: NTIS HC A13/MF A03 CSCL 22B

A detailed description of the space shuttle vehicle and associated subsystems is given. Space transportation system propulsion, power generation, environmental control and life support system and avionics are among the topics. Also, orbiter crew accommodations and equipment, mission operations and support, and flight crew complement and crew training are addressed. J.M.S.

N81-31277*# Planning Research Corp., Washington, D. C.
LIGHTNING PROTECTION SYSTEM FOR SPACE SHUTTLE Final Report
Aug. 1977 154 p refs Sponsored by NASA
(NASA-CR-164742; TR-1530) Avail: NTIS HC A08/MF A01 CSCL 22B

The suitability and cost effectiveness of using a lightning mast for the shuttle service and access tower (SSAT) similar to the type used for the Apollo Soyuz Test Project (ASTP) mobile launcher (ML) was evaluated. Topics covered include: (1) ASTP launch damage to mast, mast supports, grounded overhead wires, and the instrumentation system; (2) modifications required to permit reusing the ASTP mast on the SSAT; (3) comparative costing factors per launch over a 10 year period in repetitive maintenance and refurbishment of the existing and modified masts, mast supports, grounded overhead wires, and ground instrumentation required to sustain mechanical and electrical integrity of the masts; (4) effects of blast testing samples of the ASTP ML type mast (corrosion and electrical flashover); (5) comparison of damages from ASTP launch and from blast testing. A.R.H.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N81-31278# Naval Research Lab., Washington, D. C. Geophysical and Plasma Research Branch.

NONLINEAR EQUATORIAL SPREAD F: THE EFFECT OF NEUTRAL WINDS AND BACKGROUND PEDERSEN CONDUCTIVITY

S. T. Zalesak, S. L. Ossakow, and P. K. Chaturvedi 29 Jul. 1981 60 p refs

(RR0330244)

(AD-A102555; NRL-MR-4588) Avail: NTIS HC A04/MF A01 CSCL 04/1

A simple model of the interaction of the equatorial ionosphere with the eastward F region neutral wind in the presence of evolving spread F bubbles or plumes is given. A consequence of the model is that the upper portions of plumes will take on a westward tilt, while the lower portions will tilt eastward, giving rise to the 'fishtails' and 'C's' observed by coherent backscatter radar measurements of field aligned small scale irregularities. The essence of the model is that the plasma away from the equatorial plane (e.g., a background nighttime E region at higher latitudes) makes a finite contribution to the magnetic field line integrated Pedersen conductivity, causing an incomplete coupling of the plasma motion to the neutral wind. The degree of coupling is then a function of the Pedersen conductivities both near the equator in the F region and in the higher latitude E region, giving rise to vertical shears of east-west plasma motion having opposing signs on either side of the equatorial Pedersen conductivity maximum. Evolving spread F plumes are caught up in this shear as they rise vertically, resulting in the characteristic 'C' shape seen by backscatter radar, and in the westward motion of plasma bubbles observed by satellite in situ measurements. Numerical simulations, incorporating an eastward neutral wind in the equatorial F region and E region Pedersen conductivity effects, are presented to further support the model and analysis. These simulations also show the result that it may be the eastward as well as the westward wall of the plume which is subject to secondary instabilities in the presence of an eastward neutral wind. GRA

N81-31279# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.

STUDY OF AN ATTITUDE ACQUISITION MEASUREMENT TECHNIQUE USING THE ESA STARMAPPER. PART 1: EXECUTIVE SUMMARY

P. T. L. M. vanWoerkom and F. J. Sonnenschein Paris ESA 15 Nov. 1979 24 p refs 2 Vol.

(Contract ESTEC-3625/78/NL-AK(SC))

(NLR-TR-79116-U-Pt-1) Avail: NTIS HC A02/MF A01

The rotational motion of a spin stabilized spacecraft equipped with a V slit sun sensor and a multi-slit ESA starmapper is studied. A rough estimate of the attitude motion of the spinning spacecraft is obtained from the measurements produced by the Sun sensor and starmapper assuming complete absence of an a priori attitude estimate. If higher accuracy is required the rough data may be used as input to a recursive filter. A recursive minimum variance algorithm is described, together with the details of its software implementation for a CDC Cyber 72 computer. Simulations were carried out showing that the estimated spacecraft attitude differed from the true values of no more than about one arc minute. No false star identification was observed and in only two cases were there unidentified stars. Author (ESA)

N81-31280# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.

STUDY OF AN ATTITUDE ACQUISITION MEASUREMENT TECHNIQUE USING THE ESA STARMAPPER, PART 2 Final Report

P. T. L. M. vanWoerkom and F. J. Sonnenschein Paris ESA 15 Nov. 1979 91 p refs 2 Vol.

(Contract ESTEC-3625/78/NL-AK(SC))

(NLR-TR-79116-U-Pt-2) Avail: NTIS HC A05/MF A01

An algorithm is developed to generate a rough estimate of the three attitude angles and the angular velocity of a spin stabilized satellite. Batch processing of sun sensor and eight-slit starmapper measurements collected through a number of spacecraft revolutions is used. Complete absence of an a priori estimate is assumed. A refined estimate of the attitude parameters is possible using the output of the algorithm as initial value for a recursive filter. The sequences of algorithms used the architecture of the computer program are described. A CDC Cyber 72 computer was used. Simulations were carried out showing that the estimated spacecraft attitude differ from the true values of no more than about one arc minute. No false star identification was observed and in only two cases were there unidentified stars left. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N81-31281*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROTON-INDUCED NOISE IN DIGICONS

L. Cole Smith (Old Dominion Univ., Norfolk, Va.), Jacob Becher (Old Dominion Univ., Norfolk, Va.), Walter B. Fowler, and Keith Flemming Aug. 1981 33 p refs

(NASA-TP-1852; Rept-81F0051) *Avail: NTIS HC A03/MF A01 CSCL 09F

The Space Telescope, which carries four Digicons, will pass several times per day through a low-altitude portion of the radiation belt called the South Atlantic Anomaly. This is expected to create interference in what is otherwise anticipated to be a noise-free device. Two essential components of the Digicon, the semiconductor diode array and the UV transmitting window, generate noise when subjected to medium-energy proton radiation, a primary component of the belt. These trapped protons, having energies ranging from 2 to 400 Mev and fluences at the Digicon up to 4,000 P+/sec-sq cm, pass through both the window and the diode array, depositing energy in each. In order to evaluate the effect of these protons, engineering test models of Digicon tubes to be flown on the High Resolution Spectrograph were irradiated with low-flux monoenergetic proton beams at the University of Maryland cyclotron. Electron-hole pairs produced by the protons passing through the diodes or the surrounding bulk caused a background count rate. This is the result of holes diffusing over a distance of many diode spacings, causing counts to be triggered simultaneously in the output circuits of several adjacent diodes. Pulse-height spectra of these proton-induced counts indicate that most of the bulk-related counts overlap the single photoelectron peak. A geometrical model will be presented of the charge collection characteristics of the diode array that accounts for most of the observed effects. Author

N81-31282*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT AND DESIGN OF THREE MONITORING INSTRUMENTS FOR SPACECRAFT CHARGING
John C. Sturman Sep. 1981 28 p refs
(NASA-TP-1800; E-603) Avail: NTIS HC A03/MF A01 CSCL 22B

A set of instruments which provide early detection of potentially dangerous geomagnetic substorm conditions and monitor the spacecraft response are discussed. The set consists of a sensor that measures the characteristic energy of collected electrons or ions from + 100 to - 20,000 V, a logarithmic current density sensor that measures local electron flux and a transient events counter that counts the spurious pulses from electrostatic discharges that couple into the spacecraft wiring harness. Design details and performance characteristics of the three instruments are given. Size, weight, and power requirements are minimized. E.A.K.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N81-31283*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLID ROCKET BOOSTER THRUST VECTOR CONTROL V-2 OFF-NOMINAL TESTING Technical Report, Sep. - Jul. 1980
Boris Pagan Aug. 1981 178 p refs
(NASA-TM-82439) Avail: NTIS HC A09/MF A01 CSCL 21H

The results of the V-2 off nominal test sequence performed on the space shuttle solid rocket booster thrust vector control (SRB TVC) system are reported. The TVC subsystem was subjected to 19 off nominal test conditions. The test sequence consisted of: 8 burp starts, 30 hot firings, 14 GN2 spin tests, and 3 servicing passive system tests. It is concluded that the TVC subsystem operated nominally in response to the given commands and test conditions. Test objectives, detail results, and data are included. E.A.K.

N81-31284# Propellants, Explosives and Rocket Motor Establishment, Westcott (England).
ON THE CALCULATION OF THRUST COEFFICIENT
R. C. Parkinson and S. A. Mace Feb. 1981 19 p refs
(PERME-Memo-150; BR77714) Avail: NTIS HC A02/MF A01

Momentum balance and pressure integral methods of calculating the ideal vacuum thrust coefficient are compared. The stagnation pressure and the throat area are used to calculate the thrust of rockets. The value of the ideal one-dimensional vacuum thrust coefficient is shown to be the same when calculated by each method. Investigation of the various losses suggests that the real thrust coefficient can be calculated from an expression given as a function of the divergence loss efficiency, the two phase flow loss efficiency, and the skin friction loss efficiency. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N81-31285# New York Univ., N. Y.
PHOTOELECTRON EMISSION SPECTROSCOPY OF WEAK ACIDS AND BASES AND THEIR IONS IN AQUEOUS SOLUTION
Kathrin vonBurg and Paul Delahay Jun. 1981 22 p refs Submitted for publication
(Contract N00014-75-C-0397; NR Proj. 051-258)
(AD-A102427; TR-17) Avail: NTIS HC A02/MF A01 CSCL 07/3

Threshold energies E sub t are determined for 14 weak acids and three bases and their ions. Values of E sub t are interpreted in terms of dissociation or protonation reactions involving species produced by photoionization. Electron transfer to weak acid molecules in solution is shown to occur for emission by inorganic anions and cations and weak acids. Author (GRA)

N81-31286# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
PHOTOEGENERATION OF REACTIVE ORGANOMETALLIC SPECIES Interim Technical Report
Mark S. Wrighton, James L. Graff, Romas J. Kazlauskas, James C. Mitchner, and Carol L. Reichel 8 Jun. 1981 25 p refs Submitted for publication Sponsored in part by NSF and Dow Chemical Co.
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A102069; TR-27) Avail: NTIS HC A02/MF A01 CSCL 07/3

A large number of thermally inert organometallic complexes can be photoactivated for stoichiometric and catalytic reactions using visible or ultraviolet light. In favorable cases, low temperature irradiation leads to the generation of spectroscopically detectable intermediates that likely participate in catalytic cycles at higher temperatures where the steady state concentration is too low to detect. The dissociative process of CO or H2 loss and metal-metal bond rupture can lead to the coordinatively unsaturated intermediates that pervade homogeneous and heterogeneous catalytic systems. In some cases, the same catalyst as generated thermally at high temperature can be prepared photochemically at low temperature using the same precursor. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N81-31287 Illinois Univ. at Urbana-Champaign.
ADHESION, RESIDUAL STRESSES AND TRIBOLOGY OF RF SPUTTER DEPOSITED TITANIUM CARBIDE COATINGS Ph.D. Thesis
Alfred I-Tsung Pan 1981 185 p
Avail: Univ. Microfilms Order No. 8114456

Mechanical properties of surface hard coatings depends strongly on both the adhesion of the coating to the substrate as well as the sign and magnitude of the residual stress in the coating. The residual stress in sputter deposited TiC films was found to be compressive and could be related to the trapped Ar concentration in the films. The Ar concentration, and hence the compressive stress, increased with decreasing Ar sputtering pressure, Par, due to the relationship between the substrate induced potential, Vi, and Par. High compressive stress in the TiC films enable this brittle material to withstand high tensile strain. However, too high a compressive stress would induce a high Poisson tensile stress which result in the fracture of the interface and the bulging up of the film. Incorporation of moderate amount of oxygen in the TiC films during deposition will not cause compressive stress. However, high oxygen content in the film with O/Ti higher than 0.5 would lead to second phase segregation in the TiCxO1-x matrix and result in a high compressive stress. Dissert. Abstr.

N81-31288*# Boeing Aerospace Co., Seattle, Wash. Engineering Technology Organization.
FILLERS FOR IMPROVED GRAPHITE FIBER RETENTION BY POLYMER MATRIX COMPOSITES Final Contractor Report
E. E. House and C. H. Sheppard 23 Sep. 1981 69 p refs
(Contract NAS3-22175)
(NASA-CR-165437) Avail: NTIS HC A04/MF A01 CSCL 11D

The results of a program designed to determine the extent

to which elemental boron and boron containing fillers added to the matrix resin of graphite/epoxy composites prevent the release of graphite fibers when the composites are exposed to fire and impact conditions are described. The fillers evaluated were boron, boron carbide and aluminum boride. The conditions evaluated were laboratory simulations of those that could exist in the event of an aircraft crash and burn situation. The baseline (i.e., unfilled) laminates evaluated were prepared from commercially available graphite/epoxy. The baseline and filled laminates' mechanical properties, before and after isothermal and humidity aging, also were compared. It was found that a small amount of graphite fiber was released from the baseline graphite/epoxy laminates during the burn and impact conditions used in this program. However, the extent to which the fibers were released is not considered a severe enough problem to preclude the use of graphite reinforced composites in civil aircraft structure. It also was found that the addition of boron and boron containing fillers to the resin matrix eliminated this fiber release. Mechanical properties of laminates containing the boron and boron containing fillers were lower than those of the baseline laminates. These property degradations for two systems: boron (5 micron) at 2.5 percent filler loading, and boron (5 micron) at 5.0 percent filler loading do not appear severe enough to preclude their use in structural composite applications. Author

N81-31289*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FAILURE OF MORPHOLOGY OF (0 DEG)8 GRAPHITE/EPOXY AS INFLUENCED BY ENVIRONMENTS AND PROCESSING

Linda L. Clements and Michael J. Adamson Aug. 1981 25 p refs

(NASA-TM-81318; A-8684) Avail: NTIS HC A02/MF A01 CSCL 11D

Optical and scanning electron microscopy were used to investigate the failure morphology of graphite/epoxy specimens which had been tested until tensile failure. Failure morphology was studied as a function of the quality control variables of specimen preparation technique, prepreg batch, and cure condition, and also as a function of the environmental parameters of temperature and moisture content. Defective specimens were found to exhibit a low energy failure morphology. Poor specimen edge preparation and one batch of prepreg when tested at elevated temperature or moisture content also exhibited energy failure morphology. Postcuring had no effect on strength but did slightly alter failure morphology. Temperature or moisture appeared to decrease flaw sensitivity and thus increase strength; however, moisture also appeared to increase interfacial debonding between filament and matrix. When combined moisture and temperature increased interfacial debonding and made the epoxy matrix more prone to fracture. Author

N81-31290*# Westinghouse Research and Development Center, Pittsburgh, Pa.

SILICONE MODIFIED RESINS FOR GRAPHITE FIBER LAMINATES Final Report

L. W. Frost and G. M. Bower 18 Dec. 1980 78 p refs

(Contract NAS3-22048)

(NASA-CR-165451; Rept-80-9B7-SIMOD-R2) Avail: NTIS HC A05/MF A01 CSCL 11D

Six silicone modified resins were selected for evaluation in unidirectional filament wound graphite laminates. Neat samples of these resins had 1,000 C char residues of 6-63%. The highest flexural values measured for the laminates were a strength of 1,220 MPa and a modulus of 105 GPa. The highest interlaminar shear strength was 72 MPa. R.C.T.

N81-31291# Research Inst. of National Defence, Stockholm (Sweden).

INVESTIGATION OF THE BREAKDOWN OF CARBON FIBER ELECTRICAL RESISTANCE OF THE RESULTING SMALL PARTICLES [UNDERSOEKNING AV KOMPOSITERS NEDBRYTNING GENOM VAERME OCH DAERVID ALSTRADE SMAAPARTIKLARS FORM OCH ELEKTRISKA MOTSTAAND]

Tom Karlsson Mar. 1980 9 p refs In SWEDISH

(FOA-C-20349-F9) Avail: NTIS HC A02/MF A01

Small particles of carbon fiber composites 3501/EHTS (Hercules 3501), 3501/HMS, Fiberdux 914C/T-300, and Fiberdux 914C/MS-5 were heated to various temperatures between 1200 and 350 C during time periods of different durations. All samples decomposed first by delamination. Thereupon separate layers were broken down into smaller particles or bunches of semifree carbon fibers, and when destruction had progressed over a protracted period of time, free carbon fibers were formed. By then their diameter had diminished considerably. The plastic mass formed partly gaseous products and partly tar-like substances which contributed significantly to the minimal existence of free carbon fibers. The electrical resistance of these fibers was not altered by the heating process. The heating of the small particles of Fiberdux 914C/T-300, produced through mechanical treatment at room temperature, had a similar effect. J.M.S.

N81-31292# Boeing Commercial Airplane Co., Seattle, Wash.

GRAPHITE REINFORCED THERMOPLASTIC COMPOSITES Final Report, 13 Feb. 1979 - 13 May 1980

J. Jaqluish, C. H. Sheppard, S. G. Hill, E. E. House, and W. A. Symonds Aug. 1980 50 p refs

(Contract N00019-79-C-0203)

(AD-A102217; D180-26067-1) Avail: NTIS HC A03/MF A01 CSCL 11/4

The objectives of this program were to: (1) Develop graphite reinforced thermoplastic composites that are resistant to aircraft fluids and, (2) Evaluate repair techniques suitable for use on aircraft stationed with the fleet. The thermoplastic resins obtained from material suppliers and evaluated were PKXA polysulfone, KM-1 polyether sulfone, XU-218 thermoplastic polyimide, CM-1 fluorocarbon based polymer, and BR-31 polyphenylene sulfide. Also, a modified polysulfone (NTS 20-1) was invented, synthesized and evaluated. Resin characterization studies were performed. Impregnation and laminating procedures were optimized. Mechanical properties were determined on graphite reinforced composites. A study was conducted to determine resistance of graphite fabric/thermoplastic composites to fluids likely to be encountered in aircraft flight and maintenance operations. Two procedures for repairing graphite composites using thermoplastic materials were investigated. They were: use of a glue gun and, resistance heating of a metallized scrim that had been impregnated with a thermoplastic resin. Author (GRA)

N81-31293# Massachusetts Inst. of Tech., Cambridge.

FRACTURE AND FATIGUE OF BI-MATERIALS Final Report, 1 Dec. 1979 - 30 Nov. 1980

James W. Mar and Jerome C. Hunsaker Nov. 1980 113 p refs

(Contract F49620-80-C-0010; AF Proj. 2307)

(AD-A102344; AFOSR-81-0596TR) Avail: NTIS HC A06/MF A01 CSCL 11/14

Eighty-nine axially loaded, aluminum honeycomb sandwich specimens with graphite epoxy face sheets of four different laminates were compressively cycled with a minimum to maximum load ratio of R=10. Fatigue damage initiation and propagation were monitored on both graphite/epoxy faces of each specimen using Moire interferometry, a method of optically producing surface contour lines. These patterns were photographically recorded at intervals for later analysis. Life, residual strength, cycles to damage initiation and damage growth data are reported. Damage initiation site and mode are compared with the analytically predicted three dimensional stress field at the edge of the hole. The location of first observable damage in all laminates was an experimentally repeatable layup characteristic. All laminate types showed a nearly horizontal initial region of damage growth followed by a second region of gradually increasing damage area growth with loading cycles, and a final region of very rapid growth just prior to failure. Post fatigue inspection showed damage concentrated mainly in the angle plys. No well defined relationship could be established however, between specimen fracture and final damage area. Life to first damage and life to specimen failure for the four laminate types showed that both stacking sequence and ply orientation had an affect on the response of a specimen to cyclic compression loads. Author (GRA)

N81-31294# Avco Systems Div., Wilmington, Mass.

TOWARD OPTIMIZATION OF THE WOVEN FLYWHEEL

Alan D. Sapowith and William E. Handy 1 Jun. 1981 8 p refs

(Contract W-7405-eng-48)
(UCRL-15359) Avail: NTIS HC A02/MF A01

A constant stress composite flywheel incorporates fibers in the two principal stress directions: radial and circumferential. This design concept, along with two basic fabrication methods, is described. The low cost fabrication approach which incorporates a spiral weave is evaluated for its energy storage capacity. In this evaluation, several extremes of weave design are considered. It is concluded that flywheel performance depends primarily on maximizing the hoop fiber count and determining through expermentation the optimum fiber volume fraction for the composite. DOE

N81-31295# Sandia Labs., Livermore, Calif. Exploratory Chemistry Div.
DIMENSIONAL INSTABILITIES IN MIN-K 1400 ABOVE ITS EXPECTED SERVICE TEMPERATURE
W. R. Even, N. J. Manesis, and M. D. Skibo May 1981 26 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-8211) Avail: NTIS HC A03/MF A01

The response of Min-K 1400 to temperatures in excess of its recommended service limits was investigated. Severe, irreversible shrinkage was observed at temperatures greater than 10000 C. The shrinkage was found to be anisotropic and related to the direction of fiber reinforcement. The extent and rate of shrinkage was quantified. There was no evidence of crystallization or new phase formation associated with the densification. DOE

N81-31296# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France).
REALIZATION AND PERFORMANCES OF CONTOURED POLAR THREE-DIMENSIONAL CARBON-CARBON COMPOSITES BY A POLAR CONTOURED WEAVING METHOD
H. Girard, Y. Grenie, and J. P. Slonina (Le Carbone Lorraine) 1980 4 p In FRENCH; ENGLISH summary Presented at 3rd Intern. Congr. on Carbon 'Carbone '80', Baden-Baden, West Germany, 30 Jun. - 4 Jul. 1980
(SNIAS-802-422-104) Avail: NTIS HC A02/MF A01

A manufacturing procedure involving carbon-carbon composites which is especially well suited for solid rocket nozzles is described. An automatic machine for polar contoured weaving of axisymmetrical bodies was developed. The weaving spacing can be as low as 1.5 mm in the radial or circumferential directions and 0.2 mm in the longitudinal direction, resulting in a packing density of 35 to 55%. Several methods of increasing density by vapor phase or liquid phase carbon deposition are described. By using a forging pressure of 1000 bar, densities of up to 1.95 gr/cu cm are obtained. A rocket nozzle designed to work for 60 sec at 3300 K gas temperature and 50 bar gas pressure is described. The inside diameter is 100 mm with 60 mm wall thickness, (40% carbon fibers). Final density is 1.8 g/cu cm, thermal conductivity is 120 watt/sq mK and the elastic modulus is 90,000 MPa. Author (ESA)

N81-31297# Royal Aircraft Establishment, Farnborough (England).
THE INFLUENCE OF ABRASIVE FILLERS ON THE WEAR PROPERTIES OF POLYTETRAFLUOROETHYLENE (PTFE)-BASED COMPOSITES
D. C. Evans 1976 30 p refs
(RAE-TR-75144; RAE-Mat-271; BR51204) Avail: NTIS HC A03/MF A01

Wear rates of a series of composites based on PTFE and containing a variety of fillers were measured during sliding against highly polished stainless steel surfaces in dry and water lubricated conditions. Wear rates were calculated from periodic measurements of the diameter of the sliding surface of the pin and were found to be determined primarily by the topography generated on the counterface during sliding. In dry conditions all composites except those containing highly abrasive fillers produced coherent transfer films. In the presence of water, transfer film formation was prevented and wear rates were higher. Addition of alumina powder to PTFE/25 wt.% type 1 carbon fiber resulted in abrasion of stainless steel counterfaces. By suitable choice of abrasive particle size and content, initially rough counterfaces became polished, resulting in lower composite wear rates. Under optimum conditions the wear rates of such composites were essentially independent of both sliding environment and initial counterface roughness. Author (ESA)

N81-31298# ARGOS Associates, Inc., Winchester, Mass.
TECHNOLOGY ASSESSMENT OF AUTOMOTIVE APPLICATIONS OF METAL-PLASTIC LAMINATES, VOLUME 1 Final Report, Apr. - Jun. 1980
Robert Kaiser Aug. 1980 64 p refs Prepared for Corporate-Tech Planning, Inc. 2 Vol.
(Contract DOT-HS-9-02110)
(PB81-191082; DOT-HS-805798-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 13F

The current commercial status of metal-plastic technology is reviewed, and the potential automotive use of laminates over the next decade is assessed. It is projected that laminates will not have a measurable impact on the fuel economy of U.S. production automobiles at least through 1990. GRA

N81-31299# ARGOS Associates, Inc., Winchester, Mass.
TECHNOLOGY ASSESSMENT OF AUTOMOTIVE APPLICATIONS OF METAL-PLASTIC LAMINATES, VOLUME 2 Final Report, Apr. - Jun. 1980
Robert Kaiser Aug. 1980 238 p refs Prepared for Corporate-Tech Planning, Inc. 2 Vol.
(Contract DOT-HS-9-02110)
(PB81-191090; DOT-HS-805799-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 13F

An analysis is presented of the potential use of metal-plastic laminates in automotive structures based on the relative physical properties and costs of laminates to steel, and on the compatibility of the laminates with current automotive manufacturing practice. Laminate cost/weight and manufacturing analyses were performed on selected components from a passenger automobile and light duty truck. There are a number of small, non-visible, functional components currently made with steel sheet that would be likely candidates for laminate use. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N81-31300 Syracuse Univ., N. Y.
EFFECT OF OSCILLATING FLOW ON COMBUSTION RATE OF COAL PARTICLES Ph.D. Thesis
Jayant Shantaram Sabnis 1980 98 p
Avail: Univ. Microfilms Order No. 8114186

The effect of oscillating flow on combustion rate of single coal particles was studied in order to explain the high values of combustion intensity (rate of energy release per unit volume) in pulsating combustors. The reason for enhanced combustion rate is believed to be due to enhancement in rate of transport of oxygen from the far field to the particle caused by the oscillating flow. Diffusion controlled combustion of single coal particles is discussed. Burning times of captive coal particles were measured in oscillating air flows of controlled frequencies and velocity amplitudes produced in the peck of a large Helmholtz resonator. Particle burning time is reduced in oscillating flow, and the extent of reduction in burning time increases with the ratio of the displacement amplitude of air to the radius of the particle. Ash formation was found to significantly affect the combustion rate of the particles in the coal tested. Diffusion of oxygen through the ash layer formed around the particles was found to eventually limit the oxygen supply to the unburnt core of the particle. Dissert. Abstr.

N81-31301 Oklahoma Univ., Norman.
APPLICATIONS OF MULTIPROPERTY ANALYSIS IN THE PREDICTION OF COMPLEX-SYSTEM THERMOPHYSICAL

BEHAVIOR Ph.D. Thesis
Michaell Raoul Brule 1981 218 p
Avail: Univ. Microfilms Order No. 8116758

A method was developed for predicting compound characterization parameters used in multiparameter corresponding-states correlations. The technique employs multiproperty analysis of thermodynamic and transport data. Most of the property-data utilized was similar to the inspection data obtained from industrial laboratory analyses for pseudocomponent fractions making up complex hydrocarbon mixtures. These property data included vapor pressure, density, and viscosity - the analogues for fraction inspection data such as average boiling temperatures. API gravity, and Saybolt viscosity. Dissert. Abstr.

N81-31302 Stanford Univ., Calif.
ABSORPTION SPECTROSCOPY OF COMBUSTION GASES USING A TUNABLE DIODE LASER Ph.D. Thesis
Patricia Kuntz Falcone 1981 225 p
Avail: Univ. Microfilms Order No. 8115788

Measurements were made in the post flame gases of an atmospheric pressure flat flame burner doped with calibrated amounts of NO(200-10,000 ppm) to simulate a range of combustion and exhaust gas conditions. A dual beam optical systems with signal averaging was implemented to enable detection of fractional absorptions down to 0.3% in a few seconds. Data reduction procedures were developed in which the recorded lineshape was fit with a Voigt profile. Temperature nonuniformities along the optical path in the burner were found to have a significant effect on the laser absorption data and this effect was included in the data reduction procedure. Laser absorption measurements of NO were compared with measurements of NO obtained using probe sampling and chemiluminescent analysis. In fuel lean flames, laser and probe determinations generally agreed with one another and in addition, agreed with the amount of NO added to the combustion gases. In fuel rich flames, the laser and probe results also agreed; however, both indicated decomposition of some of the added NO.
Dissert. Abstr.

N81-31303 Florida Univ., Gainesville.
LASER EXCITED FLUORESCENCE AS A PLASMA PROBE: STOCHASTIC INTERPRETATIONS OF PRELIMINARY EXPERIMENTAL OBSERVATIONS Ph.D. Thesis
John David Bradshaw 1980 390 p
Avail: Univ. Microfilms Order No. 8115618

The theoretical basis for the determination of local flame and plasma number density, quantum efficiency, and temperature is developed from well-known idealistic steady state general expressions. Experimental verification of these fluorescence-based methods is shown to be feasible only under certain circumstances. Stochastic interpretations are given for the experimental results that do not fit these idealized theoretical cases. Experimental procedures which have been found prone to artifact production are also pointed out. Generalized conclusions as to the state of the art experimental measurement of local plasma characteristics by fluorescence-based methods are given. Dissert. Abstr.

N81-31304 Wisconsin Univ. - Madison.
DIELECTROPHORESIS Ph.D. Thesis
Amar Balbhadra Shah 1980 554 p
Avail: Univ. Microfilms Order No. 8105298

Particulate separation is a process crucial to various industries. Present separation processes have proven ineffective in separation of particles in the 0.1 to 100 micron size range. In order to achieve separation of particles of this size, an experimental and theoretical investigation was inaugurated into the utilization of highly nonuniform electric field gradients. In addition to the relatively easy separation of charged particles, even neutral particles can be separated from liquids and gases by polarization in a nonuniform electric field environment. The separation of neutral particles by this means is a phenomenon called dielectrophoresis, and a preliminary economic analysis indicated the attractiveness of dielectrophoresis over conventional techniques (for example, vacuum drum filtration). Dissert. Abstr.

N81-31305 Wisconsin Univ. - Madison.
FLUORESCENT PROBES IN THE SOLID STATE AND THEIR APPLICATION TO INORGANIC ION DETERMINATIONS Ph.D. Thesis sap Avail: Univ. Microfilms Order No. 8111464
Murray Vincent Johnston, III 1980 366 p

The technique of SEPIL (selective excitation of probe ion luminescence) is used to develop methods for ultratrace inorganic ion determinations where the ion of interest is coprecipitated in a host lattice and then detected by fluorescence spectroscopy. Fluorescent ions are detected by selectively exciting a specific ion in a specific crystallographic site with a nitrogen laser pumped dye laser. Nonfluorescent ions are detected by exciting a nearby fluorescent probe ion. In the latter case, the identify of the nonfluorescent analyte is revealed through its unique contribution to the crystal field shift of the probe ion transitions. Systems between the probe and anayte are introduced where one ion absorbs the incident radiation and transfer it to the other ion which then fluoresces. All of these methods are characterized for a variety of solid state systems in terms of sensitivity, selectivity, reproducibility, and potential interferences. Dissert. Abstr.

N81-31306 Michigan Univ., Ann Arbor.
THERMODYNAMIC CHARACTERIZATION OF LOW MOLECULAR WEIGHT MATERIALS IN THE GLASSY STATE Ph.D. Thesis
Devi Prasad Malladi 1981 237 p
Avail: Univ. Microfilms Order No. 8116293

Heat of solutions (delta H soln) of Aroclor 5460 and atactic polystyrene glasses were measured by techniques of solution microcalorimetry isothermally and were found to decrease linearly with temperature until the transition temperature was reached and above that remained constant. The slopes of these straight lines are identical irrespective of the thermal histories as long as the histories remained unchanged for both Aroclor 5460 and polystyrene. In the case of polystyrene, the slope is reproduced within experimental error irrespective of the molecular weight. The slopes for Aroclor 5460 and polystyrene are -0.054 and -0.09 cal/K) respectively. Dissert. Abstr.

N81-31307 Alabama Univ., University.
INSTRUMENTAL IMPROVEMENTS IN X-RAY PHOTOELECTRON SPECTROSCOPY AND APPLICATIONS TO GLASS SURFACES Ph.D. Thesis
Michael Gary Mosekot 1980 266 p
Avail: Univ. Microfilms Order No. 8114902

A three-axis magnetic field control system was built for an X-ray photoelectron spectrometer system, utilizing three mutually perpendicular sets of Helmholtz coils along with a feedback system constructed on a single printed circuit board. The unit proved capable of controlling the magnetic field to within 100 microgausses of zero during short periods (minutes). Long-term (hours) drift in the field remained under 250 microgausses. A position-sensitive detector system was implemented using a channel electron multiplier array and the risetime method of event location. The time of data acquisition was reduced by a factor 20 as compared with the narrow slit detector system previously used in the system. The spectrometer improvements resulted in an d resolution over that of the previous configuration; faster analysis times and a more convenient means of accumulating data were obtained. The improved spectrometer was used in the investigations of the high-temperature reaction of ammonia with the surface of a borosilicate glass. Dissert. Abstr.

N81-31308*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN AND ASSEMBLY CONSIDERATIONS FOR REDOX CELLS AND STACKS
Dale K. Stalnaker and Arthur Lieberman Sep. 1981 13 p refs
(Contract DE-AI04-80AL-12726)
(NASA-TM-82672; DOE/NASA/12726-10; E-954) Avail: NTIS HC A02/MF A01 CSCL 10B

Individual redox flow cells are arranged electrically in series and hydraulically in parallel to form a single assembly called a stack. The hardware currently being tested in the laboratory has an active electrode area of either 310 sq cm or 929 sq cm. Four 310 sq cm stacks, each consisting of 39 active cells, were incorporated into a 1.0 kW preprototype system. The physical design of the stack is very critical to the performance and efficiency of the redox storage sytem. This report will discuss

the mechanical aspects of the cell and stack design for the current Redox hardware, with regard to sealing the stack internally as well as externally, minimizing shunt currents and minimizing the electrical resistance of the stack. E.D.K.

N81-31309# Committee on Science and Technology (U. S. House).
ADVANCED COAL COMBUSTION SYSTEMS
Washington GPO 1980 337 p refs Hearings before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., no. 162, 16-17 Sep. 1980
(GPO-69-289) Avail: Subcomm. on Energy Development and Applications

An overview of clean coal technologies is given taking into consideration the concerns of the environmental and industrial sectors. Coal alternatives that can be made available to satisfy policies for increased coal utilization and environmental protection are discussed. These include: advanced pulverized coal plants in which the environmental control is integrated to minimize both its complexity and lack of reliability, atmospheric fluidized bed combustion, pressurized fluidized bed combined cycle plants, and gasification combined cycles. Factors which effect the selection of a particular advanced technology are addressed. J.M.S.

N81-31310# IBM Research Lab., San Jose, Calif.
THE REACTION OF HF WITH POLYACETYLENE
B. McQuillan, G. B. Street, and T. C. Clarke 28 Jul. 1981 21 p refs Submitted for publication
(Contract N00014-80-C-0779)
(AD-A102293; TR-4) Avail: NTIS HC A02/MF A01 CSCL 11/9

Anhydrous HF reacts with polyacetylene to produce a material with metallic conductivity. Infrared spectra of lightly doped samples show bands characteristic for a delocalized positive charge along the polymer chain. Upon heavier doping, conductivities of 1 to 10/(ohm-cm) are measured. Addition of ammonia produces an ammonium ion on the chain, and destroys the conductivity of the material. A discussion of the doping mechanism and related reactions is given. Author (GRA)

N81-31311# Purdue Univ., Lafayette, Ind. Thermophysical Properties Research Lab.
SPECTRAL EMISSIVITY AT HIGH TEMPERATURES Final Technical Report, 1 Feb. 1980 - 31 Jan. 1981
R. E. Taylor and D. P. DeWitt Apr. 1981 12 p refs
(Grant AF-AFOSR-3280-77; AF Proj. 2308)
(AD-A101949; TPRL-250; AFOSR-81-0576TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The status of the Spectral Emissometer used in conjunction with the high temperature Multiproperty Apparatus is described. The measurements of opaque materials, both electrically conducting, in the form of thin-walled tubes, and electrically non-conducting, in the form of small solid cylinders, has become a routine operation in the 0.4 to 15 micro range above 1300 K. The feasibility of, and techniques for, measurement of semi-transparent materials are described. Author (GRA)

N81-31312# Padua Univ. (Italy). Ist. Di Impianti Chimici.
STRUCTURE OF H2-02 FLAMES UNDER PRESSURE Final Technical Report, Oct. 1974 - Nov. 1977
I. Sorgato London European Research Office May 1981 29 p refs
(Grant DA-ERO-75-G-0152; DA Proj. 1T1-61102-BH-57)
(AD-A102108) Avail: NTIS HC A03/MF A01 CSCL 21/2

The Report illustrates the work carried out over 5 years, summarizing and correlating that which has already been set out in eight technical reports on the state of progress of the research with the addition of how much has been done since. Particularly described are: the reactor and subsidiary equipment, the equipment and measuring methods of temperature profiles, concentration of radical species, combustion velocity and finally a new hybrid-stochastic method of flame simulation. Particular emphasis is given to how much has newly been done from an experimental and theoretical point of view and to the results obtained in a field 'flame under pressure', heretofore studied little. Several sets of complete measurements have been taken at various pressures up to 4 atmospheres. GRA

N81-31313# New York Univ., N. Y. Dept. of Chemistry.
PHOTOELECTRON EMISSION SPECTROSCOPY OF AQUEOUS SOLUTIONS
Paul Delahay Jun. 1981 32 p refs Submitted for publication
(Contract N00014-75-C-0397; NR Proj. 051-258)
(AD-A102426; TR-16) Avail: NTIS HC A03/MF A01 CSCL 07/4

A review of current work on photoelectron emission spectroscopy of aqueous solutions is presented. The theoretical background covers: free energy of emission, threshold energy for emission, and reorganization free energy. Applications include: water and hydroxide ion, anions, cations, weak acids and bases, and their ions. GRA

N81-31314# Cambridge Univ. (England). Dept. of Physical Chemistry.
REACTIONS OF FREE RADICALS WITH NITRO-COMPOUNDS AND NITRATES Final Technical Report, 4 Jan. 1977 - 15 Nov. 1979
L. F. Salter and Brian A. Thrush London European Research Office 31 Mar. 1981 48 p refs
(Grant DA-ERO-77-G-015; DA Proj. 1T1-61102-BH-57)
(AD-A102286) Avail: NTIS HC A03/MF A01 CSCL 07/4

A discharge-flow system has been used to study the reaction of oxygen atoms with methyl nitrate, ethyl nitrate, nitromethane and nitroethane. In each case the initial attack involved abstraction of a hydrogen atom from the alpha-position. The pre-exponential factors were 15 x 10 to the 9th power and 3 x 10 to the 10th power/mol sec for the methyl and ethyl compounds respectively. The activation energies were all within 1 kJ/mol of 22 kJ/mol although the fragment derived from the nitrates but not from the nitro-compounds could undergo exothermic rearrangement. Product analyses and computer modelling were undertaken, these provided a clear explanation of why the nitro-compounds but not the nitrates are readily decomposed by a free-radical chain mechanism. Author (GRA)

N81-31315# Massachusetts Univ., Amherst. Astronomy Research Facility.
SCRIBE 1 DATA ANALYSIS
Hajime Sakai Apr. 1981 85 p
(Contract F19628-79-C-0062; AF Proj. 2310)
(AD-A102262; UMASS-ARF-81-315; SCIENTIFIC-1; AFGL-TR-81-0129) Avail: NTIS HC A05/MF A01 CSCL 07/4

A LiN2 cooled cat's eye interferometer was flown on October 8, 1980, at Holloman AFB under the SCRIBE program. The post-flight data analysis can be divided into three major functions: (1) extraction of the interferogram data from the PCM telemetry record; (2) recovery of the spectral data from the extracted interferograms; and (3) analysis of the spectral data in terms of the atmospheric molecular parameters. The experiment was successful only during the first 20 minutes of flight. The balloon-borne instrument failed to produce the interferogram data after the balloon reached an altitude of 6 km. Our major effort up to the present can be summarized in the following four major categories: (1) to assemble the electronics interface to receive the output data of the PCM decommutator and to modify them in a proper format for the PDP11/20 computer; (2) to implement a scheme for recording the interferogram data extracted from the PCM record onto a digital magnetic recording tape; (3) to develop a scheme for processing the produced interferogram data recorded on a magnetic tape; and (4) to improve the analysis scheme on the recovered spectral data. Our efforts in all of these activities were successful in that we were able to obtain the atmospheric emission spectra from the telemetry record. GRA

N81-31316# Massachusetts Inst. of Tech., Cambridge.
METHANE SPECTRAL ANALYSIS Final Report, 1 Sep. 1977 - 30 Sep. 1980
G. Dresselhaus Hanscom AFB, Mass. AFGL 30 Sep. 1980 48 p refs
(Contract F19628-77-C-02262; AF Proj. 2310)

(AD-A102300; AFGL-TR-81-0003) Avail: NTIS HC A03/MF A01 CSCL 07/3

The vibration-rotation Hamiltonian for cubic symmetry molecules was developed using an expansion in terms of angular momentum matrices. A computer program for ground state of the methane molecule was written which gave symmetries and values for the rotational levels. A perturbation theory was developed for the excited vibrational states based on spherical jellium molecule for the ground state. This perturbation was shown to give good convergence for the nearly degenerate v2, v4 vibrational levels in methane. Preliminary work on the development of computer programs for a calculation of the vibrational levels of molecules using LCAO x(alpha) calculations for the electronic structure was carried out. Author (GRA)

N81-31317# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.

PHOTOCHEMISTRY OF SURFACE-CONFINED ORGANOMETALLICS: PHOTOCHEMICAL RELEASE OF A SURFACE-CONFINED COBALT CARBONYL CATALYST Interim Technical Report

Carol L. Reichel and Mark S. Wrighton 8 Jun. 1981 48 p refs Submitted for publication

(Contract N00014-75-C-0880; NR Proj. 051-579)

(AD-A102112; TR-28) Avail: NTIS HC A03/MF A01 CSCL 07/3

Inorganic oxide surfaces, SiO2 and Al2O3, bearing - OH functionality have been functionalized with -Co(CO)4 by first treating the solids with (EtO)3SiH, Me2ClSiH or Cl3SiH to introduce Si(3+)H functionality followed by reaction with Co2(CO)8. Derivatized surfaces were characterized by infrared spectroscopy and compared to solution analogues to confirm the presence of Si(3+)H and Si(3+)Co(CO)4 groups on the surface. The surface-confined Si(3+)Co(CO)4 undergoes photoreactions that begin with loss of CO subsequent to optical excitation in the near ultraviolet. The photochemistry closely parallels the behavior of solution R3SiCo(CO)4 analogues: CO can be photosubstituted by P(OPh)3 and the surface confined Si(3+)Co(CO)3(P(OPh)3) species is detectable by infrared spectroscopy. Irradiation of the oxide powders bearing Si(3+)Co(CO)4 suspended in Et3SiH solutions results in the release of the -Co(CO)4 into solution as Et3SiCo(CO)4 concurrent with the regeneration of surface Si(3+)H functionality. GRA

N81-31318# AeroChem Research Labs., Inc., Princeton, N. J.

KINETICS OF SOME METAL ATOM AND METAL FLOURIDE OXIDATION REACTIONS RELEVANT TO AIR FORCE TECHNOLOGY DEVELOPMENT Final Report, 1 Feb. 1977 - 30 Sep. 1980

William Felder Mar. 1981 20 p refs

(Contract F49620-77-C-0033; AF Proj. 2308)

(AD-A102415; AEROCHEM-TP-411; AFOSR-81-0599TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

This experimental work provides kinetic data on metal oxidation reactions for rocket propulsion and ramjet technology programs using the HTFFR (high temperature fast flow reactor) technique over the temperature range 300 to 1900 K. Mechanisms and rate coefficients were obtained from optical measurements of the consumption of metal atoms or metal monoxide radicals, as functions of pressure, oxidizer concentration, reaction time, and temperature. Rate coefficient measurements on the reaction of aluminum atoms with nitrogen trifluoride were made over the range 300 to 1000 K, and an Arrhenius expression derived. Above 800 K, gas chromatographic measurements show a thermal decomposition of the trifluoride. Experiments on aluminum monoxide (A IO) reactions indicate that the O-AIO bond strength is probably greater than 126 kcal per mol. Magnesium atoms appear to react with molecular oxygen at 1900 K. Tests of means to vaporize elemental boron are reported. Thermal and microwave discharge dissociation of diborane and boron trichloride produce small quantities of atomic boron; these methods appear more suitable for generating boron monohalides or boron monoxide (in the presence of molecular oxygen). GRA

N81-31319# AeroChem Research Labs., Inc., Princeton, N. J.

IONIC MECHANISMS OF CARBON FORMATION IN FLAMES Final Report, 1 Jan. 1977 - 31 Dec. 1980

H. F. Calcote and D. B. Olson May 1981 220 p refs

(Contract F49620-77-C-0029; AF Proj. 2308)

(AD-A102411; AEROCHEM-TP-413; AFOSR-81-0611TR) Avail: NTIS HC A10/MF A01 CSCL 21/2

A critical survey of the literature and experimental mass spectrometric studies of ion profiles in low pressure acetylene and benzene flames support an ionic mechanism of soot nucleation. The initial precursor ion, C3H3-, is produced by chemi-ionization and this ion grows by very rapid ion-molecule reactions with acetylene and other C(x)H(y) species to produce larger ions which eventually become incipient soot particles. Preliminary computer simulations using the proposed mechanism qualitatively describe many of the observed experimental features including the rapid growth of large ions. A new definition of the Threshold Soot Index, TSI, as a relative number varying from 0 to 100 (from least to greatest tendency to soot) makes it possible to organize all literature data on both premixed flames and diffusion flames into two rational sets so that the effect of molecular structure on sooting determined by different techniques can be compared. The results show more major differences from accepted trends. Selected available data on soot formation in gas turbine combustors for various fuel compositions have been compared with laboratory data on soot formation for various fuels in a search for a simple correlation. For some sets of data such a correlation was found for TSI, or the reciprocal of the fuel smoke point (related to TSI), but for other sets of data the correlation was poor. The reasons for the differences are not understood. Author (GRA)

N81-31320# Science Applications, Inc., Canoga Park, Calif. Combination Dynamics and Propulsion Technology Div.

COMBUSTION IN HIGH SPEED AIR FLOWS Interim Technical Report, Apr. 1981

W. N. Bragg, J. C. Chien, G. C. Cooper, R. B. Edelman, and P. T. Harsha Jun. 1981 72 p refs

(Contract F49620-80-C-0082; AF Proj. 2308)

(AD-A102336; SAI-81-030-CP; AFOSR-81-0594TR) Avail: NTIS HC A04/MF A01 CSCL 21/5

This report covers: (1) the application of a modular combustor model for the liquid fueled sudden expansion combustor configuration to the analysis of flame stability and the interpretation of combustor test data; (2) the extension of the modular model to the analysis of boron slurry fueled ramjet combustors; and (3) the development of analytical models of the ducted rocket combustor. The modular approach is demonstrated to be a useful tool for the analysis and interpretation of sudden-expansion combustor flame stabilization phenomena and to be of considerable utility in the analysis of combustor test data. Models for the combustion of boron particles are reviewed and put into a form suitable for incorporation in a modular model of a boron slurry fueled combustor. Particle tracking methods suitable for use in the context of a modular model formulation have been defined and developed for the required application. The approach required to provide an analytical model of the three-dimensional recirculating flow in a ducted rocket combustor has been defined and the development of an aerodynamic model has been initiated. GRA

N81-31321# Tennessee Univ., Knoxville. Dept. of Physics.

LIMITS OF STUDYING HIGH-SPIN STATES BY DISCRETE-LINE GAMMA-RAY SPECTROSCOPY

L. L. Riedinger 1980 47 p refs Presented at Nobel Symp. on Nuclei at Very High Spin, Lund, Sweden, Jun. 1980 Prepared in cooperation with ORNL, Tenn.

(Contract DE-AS05-76ER-04936)

(CONF-8006160-1) Avail: NTIS HC A03/MF A01

Recent (HI, xn) data on rotational Yb and Hf nuclei are used to describe the motivations and techniques for pushing discrete-line spectroscopy to the realm of the weakly populated yrast and nonyrast states. Three aspects of these studies are discussed: extraction of moments of inertia in different aligned bands; observation and understanding of high frequency band crossings; and dependence of feeding patterns on nuclear structure. DOE

N81-31322# Brigham Young Univ., Provo, Utah.

INVESTIGATION OF SULFUR-TOLERANT CATALYSTS FOR SELECTIVE SYNTHESIS OF HYDROCARBON LIQUIDS FROM COAL-DERIVED GASES Quarterly Technical Progress

Report, 19 Dec. 1980 - 18 Mar. 1981
Calvin H. Bartholomew 20 Apr. 1981 30 p refs
(Contract DE-AC01-79ET-14809)
(DOE/ET-14809/6) Avail: NTIS HC A03/MF A01

During the sixth quarter, a 15 weight % boride promoted, silica supported iron catalyst was prepared. Preparations of unsupported cobalt and iron borides were in progress. Characterization of supported iron catalysts by O2 titration and H2 and CO chemisorption showed dispersions to range from 1.6% to 9.3% and percent reductions to range from 12 to 80%. Reduction was essentially optimum after 36 hours in flowing H2 at 725 K. The CO2 chemisorption on potassium promoted and unpromoted iron catalysts showed surface concentration of the potassium to be markedly greater than bulk concentration. Activity/selectivity measurements were performed on four iron/silica catalysts and one iron boride/silica catalyst. The iron boride/SiO2 catalyst was found to be relatively inactive in comparison to the iron/silica catalysts. Increasing H2/CO ratio shifted selectivity of iron/silica to lower molecular weight products; the addition of potassium greatly echanced production of higher molecular weight hydrocarbons at the expense of CH4 production. Alchohols and CO2 were also detected as products of the reaction. DOE

N81-31323# Combustion Power Co., Inc., Menlo Park, Calif.
LIGNITE COMBUSTION TEST PROJECT SUMMARY REPORT Summary Report
Jun. 1981 39 p refs
(Contracts DE-AC18-78FC-0203; EW-78-C-03-2030)
(DOE/FC-02030/T1) Avail: NTIS HC A03/MF A01

Fluidized bed combustion research on North Dakota lignite is reported. A 250-h test on Beulah, North Dakota lignite is reported and analyzed. DOE

N81-31324# California Univ., Livermore. Lawrence Livermore Lab.
FLAME PROPAGATION IN GASEOUS FUEL MIXTURES IN SEMICONFINED GEOMETRIES
P. A. Urtiew 7 Apr. 1981 37 p refs
(Contract W-7405-eng-48 oi MF)
(UCID-19000) Avail: NTIS HC A03/MF A01

Work on flame propagation in gaseous fuels contained in semiconfined geometries is reported. Parameters that have an effect on flame propagation, flame acceleration, and the transition from deflagration to detonation are described. Turbulence-producing obstacles in the flow path are the primary cause of acceleration of the flame front. DOE

N81-31325# Pennsylvania State Univ., University Park. Dept. of Chemistry.
PHOTOCHEMISTRY AND RADIATION CHEMISTRY OF VOLATILE SILANES, GERMANES AND PHOSPHINES Progress Report, 16 Aug. 1980 - 30 Apr. 1981
F. W. Lampe 1981 21 p refs
(Contract DE-AS02-76ER-03416)
(DOE/ER-03416/21) Avail: NTIS HC A02/MF A01

Investigation of the radiation induced decompositions of silane, germane and phosphine systems during the report period may be subdivided into the following two types: (1) photochemical decompositions where initiation of the decomposition of silanes, germanes and phosphines by direct photolysis and by photosensitization techniques is carried out in flow systems that are analyzed continuously by mass spectrometry; (2) ion-molecule reactions where identification and study of the ion-molecule reactions characteristic of silane, germane and phosphine systems are conducted using the techniques of tandem and high-pressure mass spectrometry. Progress reports of the following studies are presented: formation of GeH5 (+) and the proton affinity of GeH4; the 147-nanometer photolysis of methylsilane; the role of collision complexes in the reaction of silyl ions with ethylene; the 147-nanometer photolysis of phosphine-silane mixtures; the infrared multiphoton decomposition of silane; the infrared multiphoton decomposition of phosphine; the reaction of SiH2 radicals with HCl; and the 147-nanometer photolysis of phosphine and phospine-d3. DOE

N81-31326# Brown, Boveri und Cie, A.G., Heidelberg (West Germany). Central Research Lab.
EXHAUST SENSOR FOR HEATING SYSTEMS
Final Report
Franz-Josef Rohr, Hubert Holick, Armin Minor, and Arthur Rentel (Gaswaerme Inst., Essen) Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 117 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-054; ISSN-0340-7608) Avail: NTIS HC A06/MF A01

The development of an electrochemical exhaust sensor and a method for continuous measurement of the air-fuel ratio (AFR) of a burner is described. This ratio determines the efficiency and the contaminant emission of combustion processes. The AFR gauge consists of a zirconium oxide electrolyte sensor and auxiliary equipment for the stabilization of a gas flow and dosage of small gas quantities. Different oil and gas fueled burners were tested and the results demonstrate the proper functionning of the sensor. With its aid feedback optimization of the combustion process is possible. Improvements of burn efficiency of up to 10 % are reported. Author (ESA)

N81-31327# National Bureau of Standards, Washington, D.C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 86, NUMBER 1 Bimonthly Report, Jan. - Feb. 1981
1981 169 p refs
(PB81-196198; LC-63-37059) Avail: NTIS HC A08/MF A01 CSCL 07D

The following articles are presented: Fitting curves and surfaces with monotonic and non-monotonic four parameter equations; The refractivity of air; The configurations 3d(n)4p + 3d(n-1)4s4p + 3d(n-2) 4 doubles 4p in the first spectra of the iron group; An isoparametric finite element model for large-strain elastostatics. GRA

N81-31328# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
ATMOSPHERIC MEASUREMENTS OF SELECTED HAZARDOUS ORGANIC CHEMICALS Interim Report
H. B. Singh, L. J. Salas, A. Smith, R. Stiles, and H. Shigeishi May 1981 55 p refs
(Contract EPA-CA-805990)
(PB81-200628; EPA-600/3-81-032) Avail: NTIS HC A04/MF A01 CSCL 07D

Methods were developed for the accurate analysis of an expanded list of hazardous organic chemicals in the ambient air. On-site analysis using an instrumented mobile laboratory was performed for a total of 44 organic chemicals. Twenty of these are suspected mutagens or carcinogens. Toxicity studies for several others are currently pending. Six important meteorological parameters were also measured. Four field studies, each about two-weeks duration, were conducted in Houston, Texas; St. Louis, Missouri; Denver, Colorado; and Riverside, California. An around-the-clock measurement schedule (24 hours per day, seven days a week) was followed at all sites, permitting extensive data collection. Widely varying weather conditions facilitated observations of pollutant accumulation and wide variabilities in concentrations of pollutants at a given site. Concentrations, variabilities, and human exposure (daily dosages) were determined for all measured pollutants. The diurnal behavior of pollutants was studied. Exposure levels at Houston, Denver, and Riverside were comparable, but levels were significantly lower at St. Louis. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N81-31329 Carnegie-Mellon Univ., Pittsburgh, Pa.
CAPILLARY INDUCED MICROSTRUCTURAL INSTABILITIES IN DIRECTIONALLY SOLIDIFIED EUTECTIC COMPOSITES Ph.D. Thesis
Thomas Francis Marinis, Jr. 1981 239 p
Avail: Univ. Microfilms Order No. 8114632

A numerical model that describes the spheroidization of fibers under the influence of capillary driven diffusion transport along

the fiber matrix interface is presented. This model predicts that fibers are most likely to pinch off at a characteristic wavelength of square root of 2 times the fiber circumference. The rate of spheroidization computed by this model is nearly an order of magnitude faster than the rate obtained from linear calculations. The computations also suggest that ovulation of a fiber end is inherently faster than the pinch off of a continuous fiber. Undulation wavelengths were measured in eutectic composites of antimony and manganes that have been subjected to isothermal aging treatments. Dissert. Abstr.

N81-31330 Wisconsin Univ., Madison.
EFFECT OF PRODUCTION CONDITIONS ON PHYSICAL AND MECHANICAL PROPERTIES OF ALUMINUM WITH LOW IRON CONCENTRATES Ph.D. Thesis
Ali Akbar Nayebhashemi 1980 187 p
Avail: Univ. Microfilms Order No. 8111471

The effect of unidirectional solidification on the mechanical and physical properties of dilute aluminum iron alloys were studied. A four-lead potential difference method and an eddy current decay technique were used to find the effect of the growth rate temperature gradient and mode of solidification on residual resistivity at 4.2 K. Tensile strength test and brinell hardness were applied to find the effects of solidification parameters on mechanical properties. Macroscopic and microscopic examination of the samples were done to reveal structural changes. Scanning electron microscopic analyses were applied to determine the iron distribution in unidirectionally solidified samples. Dissert. Abstr.

N81-31331 Wisconsin Univ. - Madison.
FACTORS AFFECTING GRAPHITE MORPHOLOGY, MATRIX STRUCTURE AND TENSILE PROPERTIES OF COMPACTED GRAPHITE CAST IRONS Ph.D. Thesis
Hyun Keun Park 1981 238 p
Avail: Univ. Microfilms Order No. 8112555

The scanning electron microscopic observations indicate that graphite morphologies can be changed from one form to another over a wide range of graphite formations by altering the solidification cooling rate and/or the amount of nodulizing elements present such as magnesium or rare earths. It was also observed that those changes occur by a gradual change in the graphite morphology and do not occur in an interrupted manner which would be characteristic of unique nucleation events required for each graphite form. Increasing cooling rate and/or increasing the effective presence of nodulizing elements resulted in the following change in graphite formations: type A flake, type B flake, type D undercooled flake, coral, compacted, deteriorated forms of spheriodal, and spheroidal graphite.
Dissert. Abstr.

N81-31332 Illinois Univ., Urbana.
DELAYED FAILURE CHARACTERISTICS OF PLASMA-SPRAYED ALUMINUM OXIDE APPLIED TO STAINLESS STEEL AND TITANIUM ALLOY SUBSTRATES IN VARIOUS PHYSIOLOGICAL MEDIA Ph.D. Thesis
Mattison Kent Ferber 1981 412 p
Avail: Univ. Microfilms Order No. 8114418

Aluminum oxide coatings were applied to the ends of cylindrical metal samples of both 316L stainless steel and Ti-6Al-4V ELI using a plasma spraying process. These samples were fabricated into 4-point bend specimens which were then used to determine the strength. The characteristics of stress assisted crack growth in these specimens were also analyzed using static and dynamic fatigue tests conducted in various physiological media at body temperature. The resulting information was used to evaluate these materials as potential biomaterials. In order to provide fundamental insights into the nature of the failure mechanisms, tests were also conducted as a function of temperature. Finally, special variations were made in the spraying process in an attempt to improve both the strength and resistance to stress corrosion in the two ceramic-metal systems.
Dissert. Abstr.

N81-31333 Rice Univ., Houston, Tex.
CERTAIN PHYSICAL PROPERTIES OF TRANSITION METAL ALLOYS Ph.D. Thesis
Paulo Cesar DeCamargo 1981 84 p
Avail: Univ. Microfilms Order No. 8116953

The linear coefficient of thermal expansion of Nb-Mo alloys was measured and its correlation with the anomalous behavior of the elastic constant C sub 44 was demonstrated. The coincidence of the anomaly near the critical composition of 40% Mo was made evident. The Gruneisen parameters, both at low temperature and high temperature, were calculated and compared to the values of the Gruneisen parameters, obtained from the pressure derivative of elastic constants. The floating-zone technique, using a combination of R.F. induction and resistance heating, was successfully used to make large single crystals of Chronium-rich Vanadium alloys. The elastic constants C sub 11 and C sub 44 of Chromium alloys containing 0.67% and 1.5% Vanadium were determined by the pulse-superposition method. The C sub 12 was evaluated from smooth curves drawn as a function of temperature for C sub 11 and C prime. The addition of Vanadium to Chromium lowers both Neel and spin-flip temperatures drastically. The sharp minimum in the elastic constant C sub 11 in Chromium is diminishing by the addition of Vanadium. Dissert. Abstr.

N81-31334 Stanford Univ., Calif.
THE SEPARATE ROLES OF FOREST DISLOCATIONS AND SUBGRAINS IN THE ISOTROPIC HARDENING OF TYPE 304 STAINLESS STEEL Ph.D. Thesis
Michael Ernest Kassner 1981 200 p
Avail: Univ. Microfilms Order No. 8115801

The microstructural parameters dislocation density and subgrain size were correlated with the elevated temperature flow stress in Type 304 stainless steel. A relationship was formulated by elevated temperature tests of a variety of transient structure specimens, each having a characteristic subgrain size that is not functionally related to its dislocation density. To provide samples of this kind, spectral thermal and mechanical processing was utilized. Samples were creep tested, torsionally, to steady state at a variety of appropriately high temperatures and strain rates. This warm working produced a variety of steady state structures characterized by various subgrain sizes that were intrinsically related to the density of dislocations in the subgrain. To provide dislocation densities not related to the subgrain size within individual specimens, the different steady state structures were cold worked in torsion by various amounts. The cold work homogeneously increased the dislocation density while all other microstructural features remained fixed. Dissert. Abstr.

N81-31335 Rice Univ., Houston, Tex.
HYDROGEN IN METALS Ph.D. Thesis
Wei-Ming Yei 1981 99 p
Avail: Univ. Microfilms Order No. 8117008

The thermodynamics of dilute platinum-hydrogen solid solutions and the diffusivity of hydrogen in nickel vandium solid solutions are discussed. For the thermodynamics of dilute platinum hydrogen solutions, the solubility of hydrogen in platinum is measured. The equilibrate quench analyze technique employed. The partial molar enthalpy and excess entropy of hydrogen are calculated. It is concluded that this type of solution behaves in excellent agreement with the quasi regular model. For the diffusivity of hydrogen in Ni-V solutions, the diffusivity is determined by using the permeation time lag technique. It is found that the hydrogen diffusivity obeys the Arrhenius relationship, and the effect of V additions is remarkably small, even for the highest V-composition. The decrease of the hydrogen mobility caused by the trapping sites adjacent to the vanadium atoms is compensated by an increase of the hydrogen mobility created by the dilation of the Ni-V matrix lattice. Dissert. Abstr.

N81-31336 Ohio State Univ., Columbus.
CORROSION AND STRESS CORROSION CRACKING OF TYPE 304 STAINLESS STEEL AND CARBON STEEL IN SIMULATED BOILING WATER REACTOR Ph.D. Thesis
Ho Jin Choi 1981 212 p
Avail: Univ. Microfilms Order No. 8115089

It was found that A508 C1.2 steel undergoes stress corrosion cracking in pure water containing 1 or 8 ppm of oxygen at temperatures ranging from 100 to 288 C. At temperatures of 100 and 150 C, cracks nucleate at corrosion pits. At higher temperatures, however, cracks nucleate beneath hematite crystals which grow via dissolution-precipitation upon a base oxide film at sites of high dissolution. The susceptibility to SCC increases

with increasing oxygen concentration but passes through a maximum as a function of temperature at 250 C. The susceptibility of sensitized Type 304 stainless steel and ASTM A508 C1.2 steel to SCC in high temperature oxygenated water, as determined using constant extension rate tests, is found to depend upon the velocity of the fluid flow past the gauge section. This work has demonstrated that in both cases, the failure time increases with increasing flow rate and that both the crack initiation time and the apparent crack propagation rate depend upon the flow velocity. The longer failure time is mainly attributed to an increase in the crack initiation time. Dissert. Abstr.

N81-31337 Connecticut Univ., Storrs.
ELECTRODE POLARIZATION STUDIES IN HOT CORROSION SYSTEMS Ph.D. Thesis
Kyoo Young Kim 1981 256 p
Avail: Univ. Microfilms Order No. 8115304

Hot corrosion processes on specimens of nickel, Armco iron, 1018 steel, and types 304 and 316 stainless steels were evaluated by electrode polarization. An alumina-sheathed Pt, CO/CO2/Na2CO3 electrode was used as a reference electrode, and proved to be a relevant reference electrode to monitor the potential of a corroding electrode independently of cell pressure and cell contamination. On nickel, the most thoroughly studied of those electrodes, a single cathodic reaction, reduction of CO3, and three anodic reactions occur under reducting CO/CO2 environments. The litter include oxidations of CO at the nickel surface, oxidation of nickel to nickelous state, possibly, oxidation of CO at the nickel oxide surface. Dissert. Abstr.

N81-31338 Illinois Univ. at Urbana-Champaign.
OXYGEN DIFFUSION IN VANADIUM-BASED ALLOYS Ph.D. Thesis
Roberto Ribeiro DeAvillez 1981 114 p
Avail: Univ. Microfilms Order No. 8114409

The experimental study of transport and equilibrium properties of oxygen in vanadium-based alloys was made by EMF measurements on solid electrolytic cells over the temperature range of 873-1423 K. The oxygen diffusion in vanadium was not significantly modified by small additions of Ti, Cr, Ni, Nb and Ta. The increase in the activation energy for oxygen diffusion in the V-based alloys containing Cr, Ni, Nb and Ta probably reflects the effects of these substitutional solutes on the activity coefficient of oxygen. The oxygen activity was increased by the addition of 1 at % of Cr, Ni and Nb, and decreased by the addition of Ti and Ta. However, the effects in the alloys containing Nb and Ta are very small. Approximate values for the first order elastic interaction energy between a substitutional solute and oxygen interstitial were computed and compared with the oxygen binding energies to substitutional solutes in niobium. These comparisons together with the present results for the vanadium system suggest that the main contribution to the interactions between substitutional-interstitial solutes arises from chemical effects. Dissert. Abstr.

N81-31339*# United Technologies Research Center, East Hartford, Conn.
STUDY OF THE EFFECTS OF GASEOUS ENVIRONMENTAL ON THE HOT CORROSION OF SUPERALLOY MATERIALS Final Report
J. G. Smeggil Jul. 1981 89 p refs
(Contract NAS3-22488)
(NASA-CR-165464; R81-915215-4) Avail: NTIS HC A05/MF A01 CSCL 11F

Studies have been conducted to examine the effect of low concentrations of NaCl(g) on the high temperature oxidation behavior of complex superalloys and potential coating formulations modified by silicon and reactive element (i.e., yttrium and hafnium) additions. Depending on alloy composition, a variety of effects were thermogravimetrically produced. Aluminum free alloys such as MAR-M509 and Hastelloy X with molybdenum and tungsten in solid solution showed accelerated (or breakaway) kinetics similar to that observed for Ni-Cr alloys. For IN-792, an alloy high in chromium and low in aluminum, molybdenum and tungsten present in solid solution does not adversely affect oxidation kinetics in the presence of NaCl(g). On the other hand, nickel-base alloys high in aluminum and molybdenum are catastrophically attacked by NaCl-bearing atmospheres. Silicon additions were, in general, observed to slightly improve the oxidation resistance of Ni, Ni-40Cr and CoCrAlY compositions in NaCl(g)-bearing atmospheres. To the degree that processes responsible for Al2O3 whisker formation deleteriously affect protective scale adherence, the addition of yttrium or hafnium can inhibit such whisker growth. Author

N81-31340*# Case Western Reserve Univ., Cleveland, Ohio.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF BULK YTTRIA-PARTIALLY-STABILIZED ZIRCONIA Final Report
Peter G. Valentine, Ralph D. Maier (Gould, Inc.), and Terence E. Mitchell Aug. 1981 82 p refs
(Grant NsG-3252)
(NASA-CR-165402) Avail: NTIS HC A05/MF A01 CSCL 11B

A commercially available bulk 4.5 mole percent yttria-Y2O3)-partially-stabilized zirconia (PSZ) was studied by light microscopy, X-ray analysis, microhardness measurement, and fracture toughness testing. The growth of the precipitates and the phase transformations were studied as a function of aging in air at 1500 C. Aging cuves were constructed for both the as-received and the solution-annealed-and-quenched materials; the curves showed hardness peaks at 1397 and 1517 kg/sq mm, respectively. A total of twelve different types of tetragonal precipitates were found. The rectangular plate-shaped tetragonal precipitates were found to have a (110) habit plane. Grinding of the Y2O3 PSZ into powder did not cause a significant amount of metastable tetragonal precipitates to transform into the monoclinic phase, thus indicating that transformation toughening is not a significant mechanism for the material. The fracture toughness of the aged and of the unaged solution-annealed-and-quenched PSZ was found to be between 2 and 3 MN/cu m/2. Author

N81-31341# Research Inst. of National Defence, Stockholm (Sweden).
RSV FOR ALUMINUM [RSV MOT ALUMINIUM]
Jan Ekberg Mar. 1980 34 p refs In SWEDISH
(FOA-C-20348-D4) Avail: NTIS HC A03/MF A01

The protection capability and the shape of the stand-off curve for RSV of two types of aluminum (Al 4212 and Al 4338) were assessed. The experiment used 26 pieces of 45 mm RSV-loadings, containing 93% of compressed octagen, which were exploded against 10 mm thick target tiles placed in a pile. The detonation distances were 2, 10, 15, and 20 times the caliber of the explosive with at least three explosions at each distance. The tiles were checked and measured for Vickers-hardness. Penetrations and the diameters of the ensuing holes were measured. Diagrams show the results for commercial iron SIS 1311, aluminum SIS 4212-6, and aluminum SIS 4338-6. In these diagrams the X-axis shows distance in mm from detonation, and the Y-axis shows penetration in mm. A graph shows the safety factor between the iron and the two aluminums, where the Y-axis indicates the safety factor. J.M.S.

N81-31342# Polytechnic Inst. of New York, Farmingdale. Microwave Research Inst.
CHANGE IN REFLECTIVITY OF METALS UNDER INTENSE LASER RADIATION, REVISION Final Technical Report, 1 Apr. 1978 - 30 Sep. 1980
William T. Walter May 1981 39 p refs
(Grant AF-AFOSR-3557-78; AF Proj. 2306)
(AD-A102005; POLY-MRI-1412-80-Rev; AFOSR-81-0567TR)
Avail: NTIS HC A03/MF A01 CSCL 11/6

The reflectance behavior of a target surface during laser irradiation determines the laser energy which is directly absorbed. Experimentally, the reflectance of a metal surface has been reported to undergo a sharp and substantial decrease during an intense laser pulse. Explanations have been offered based on an increase in electron-photon collision frequency as the temperature of the metal surface rises to the melting point of the metal. For high conductivity metals such as copper, we have shown that the temperature dependence of a Drude-type free-electron model can not explain the substantial reflectance changes reported. Three other classes of explanations have been proposed: (1) deformation of the metal surface, (2) plasma formation in the front of the target, or (3) a nonlinear process causing enhanced absorption within the metal. Specular and total reflectances of metal surfaces during ruby laser irradiation have been measured

at the Polytechnic. The laser energy absorbed has been calculated and the temperature history of the metal surface determined using a one-dimensional heat-conduction approach. Reflectance and temperature histories have been related to permanent changes observed in the metal target surface. Only at temperatures significantly above the melting point of the metal does a substantial decrease in the total reflectance occur. Author (GRA)

N81-31343# Ammann and Whitney, New York.
BLAST-RESISTANT CAPACITIES OF COLD-FORMED STEEL PANELS Final Report
William Stea, Fredrick E. Sock, and Joseph P. Caltagirone (Army Armament Research and Development Command, Dover, N.J.) Dover, N.J. Army Armament Research and Development Command May 1981 117 p refs
(Contract DAAK10-77-C-0134)
(AD-A101915; AD-E400610; ARLCD-CR-81001) Avail: NTIS HC A06/MF A01 CSCL 13/13

Cold formed steel panels and widely used in the construction of steel structures and preengineered buildings at explosives manufacturing and storage facilities. The behavior of these panels differs significantly from that of the hot rolled structural members due to the large width to thickness ratios of the elements that constitute their cross sections. In an earlier project designed criteria were established for cold formed steel panels. This report documents subsequent tests which were performed to verify or refine these design criteria. The actual tests were conducted at the Dugway strength observed in the test panels was due to the actual static stresses (which exceeded the minimum stress at yield of 227,500 kPa (33,000 psi)). The tests revealed that the maximum ductility ratio criteria of 1.25 for usable structures and 1.75 for nonreusable structures can be increased to 3.0 and 6.0, respectively. Other determinations included: (1) the total moment of inertia should be substituted for the effective moment of inertia when calculating the natural period and elastic deflections; (2) open hat shaped panels can be used for closed sections in low pressure ranges; and (3) standard screw-type connections performed adequately in blast tests up to 34.5 kPa (5 psi). GRA

N81-31344# Rockwell International Science Center, Thousand Oaks, Calif.
SUPERPLASTIC FORMING AND DIFFUSION BONDING OF CORONA 5 Final Technical Report, 1 Sep. 1979 - 15 Nov. 1980
J. C. Chesnutt, C. H. Hamilton, and C. F. Yolton Jun. 1981 64 p refs
(Contract N00019-79-C-0465)
(AD-A102206; SC234.6FR) Avail: NTIS HC A04/MF A01 CSCL 11/6

The processing of CORONA 5 (Ti-4.5 Al-5 Mo-1.5 Cr) to cold-rolled sheet and the subsequent evaluation of this sheet for superplastic formability, diffusion bondability and post-forming heat treatment response is discussed. Two heats of CORONA 5, one of 'standard' oxygen content (0.183 wt %) and one of low oxygen content (0.085 wt %) were processed to fine-grained, 0.07 in (1.8 mm) sheet and limited characterization of the sheet material conducted. Superplastic properties were determined at 843, 871 and 899 C; diffusion bonding parameters were predicted for all three temperatures and evaluated at 871 C. Adequate superplastic properties were observed at all temperatures with the lower temperatures exhibiting better properties. The optimum superplastic forming and diffusion bonding temperature was found to be 871 C, particularly for low oxygen material. Pan forming tests at all three temperatures and the expanded sandwich test at 871 C confirmed these observations. The results of the program have demonstrated that by controlling the oxygen content of CORONA 5 and by processing to a small grain size, a highly desirable combination of SPF/DB response and post-forming tensile properties could be obtained and that the alloy is amenable to sheet processing using a continuous-strip process. GRA

N81-31345# Argonne National Lab., Ill.
DE HASS-VAN ALPHEN MEASUREMENTS OF ONE-ELECTRON AND MANY-BODY EFFECTS IN TRANSITION METALS AND INTERMETALLIC COMPOUNDS
G. W. Crabtree, W. R. Johanson, S. A. Campbell, D. H. Dye, D. P. Karim, and J. B. Ketterson (Northwestern Univ.) 1980 12 p refs Presented at the Intern. Conf. on Phys. of Transition Metals, Leeds, England, 18-22 Aug. 1980
(Contract W-31-109-eng-38)
(CONF-800864-2) Avail: NTIS HC A02/MF A01

Examples are given which demonstrate the power and versatility of the dHvA effect in studying electronic behavior in metals. In transition metals the parameterization schemes give a very complete and consistent picture of the k-dependent and surface averaged electronic properties. Because the one-electron behavior is fairly well known, the many body contribution to the Fermi velocity can be isolated and its detailed anisotropy can be displayed. This kind of information is directly relevant to the calculation of electron-phonon interaction effects and cannot be derived by any other means. DOE

N81-31346# Brown Univ., Providence, R. I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Annual Progress Report, 1980 - 1981
R. J. Asaro, J. Gurland, A. Needleman, and J. R. Rice Jun. 1981 60 p
(Contract DE-AC02-80ER-10556)
(DOE/ER-10556/85; TR-85) Avail: NTIS HC A04/MF A01

Recent progress was achieved in refining and generalizing the methods previously developed for treating the stable crack growth problem, with particular attention to the approximate asymptotic solution of Rice, Drugan and Sham for stress and deformation fields near the tip of a growing crack. The microstructural aspects of ductile fracture were studied in dual-phase steels and high-strength 4340 steels. Very interesting results were obtained in the work on hydrogen effects in steels. In medium strength steels, the ductility-reducing effect of hydrogen is tentatively attributed to the accumulation of hydrogen at internal interfaces with a resulting loss in the to interfacial separation. Extension of Needleman and Rice's work on the growth of cavities at elevated temperatures to the investigation of the effects of triaxial stressing relates the rate of void growth by grain boundary diffusion and dislocation creep to the triaxaility. It provides a good model to analyze the growth of macro-cracks in polycrystals by the mechanisms of growth and coalescence of micro-voids. DOE

N81-31347# Midwest Research Inst., Golden, Colo.
INVESTIGATION OF PHOTOELECTROCHEMICAL CORROSION OF SEMICONDUCTORS Final Report, 15 Apr. 1980 - 15 Apr. 1981
Karl W. Frese, Jr., B. H. Loo, and S. Roy Morrison Apr. 1981 80 p refs Prepared in cooperation with SRI International, Menlo Park, Calif.
(Contract DE-AC02-77CH-00178)
(SERI/TR-8002-6-T1) Avail: NTIS HC A05/MF A01

A corrosion model is presented to describe the stabilization efficiency, S, of semiconductor electrodes such as GaAs. The equations developed relate S to the photocurrent; solid state properties such as capture cross sections, back bond energy levels and density of defect levels; and redox electrolyte properties including capture cross sections and rearrangement energies, lambda, of ions in solution. Homogeneous electron transfer rate data were also analyzed to determine the rearrangement energy of individual ions. DOE

N81-31348# Bendix Corp., Kansas City, Mo.
DC SPUTTER GOLD DEPOSITION ON BERYLLIUM-COPPER CONTACTS
G. J. Hale Jun. 1981 16 p
(Contract DE-AC04-76DP-00613)
(BDX-613-2629) Avail: NTIS HC A02/MF A01

A direct current sputter deposition technique was developed to allow a current viewing resistor contact to meet gold-coating requirements. The 8.8-mm-long beryllium-copper contact required a controlled gold thickness on three areas of its surface, one of which was a blind hole 0.57 mm in diameter and 4.1-mm deep. Special fixturing and three gold deposition runs, one for each critical surface, were needed to achieve the desired results. Results of an evaluation of six contacts randomly chosen from a sample

size of 525 showed that this process produces parts that meet goldcoating specifications. DOE

N81-31349# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF STRAIN-RATE AND MICROSTRUCTURE ON THE DUCTILE BRITTLE TRANSITION TEMPERATURE IN STRUCTURAL STEELS. PART 1: LITERATURE ASSESSMENT
G. A. Knorovsky Jun. 1981 29 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-0732-Pt-1) Avail: NTIS HC A03/MF A01

A literature assessment of the effect of strain rate upon the fracture toughness of low and medium strength structural steels is presented which appears to contradict accepted fracture control procedures, in particular that being used by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. An alternative approach at analyzing the collected data, which is based upon an understanding of the strengthening mechanisms acting, is suggested. This approach indicates that only the strength level, but also the actual transition temperature needs to be considered in predicting the strain-rate sensitivity of the fracture toughness. DOE

N81-31350# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEVELOPMENT OF COATINGS FOR CORROSION/EROSION PROTECTION OF INTERNAL COMPONENTS OF COAL GASIFICATION VESSELS. VOLUME 1: LASER FUSED MCrAl COATINGS Final Report, 1 Oct. 1977 - 1 Apr. 1980
P. R. Clark, C. M. Packer, and R. A. Perkins 15 Mar. 1981 142 p refs
(Contracts DE-AC01-77ET-10245; EF-77-C-01-2591)
(DOE/ET-10245/1-Vol-1) Avail: NTIS HC A07/MF A01

Sulfidation-resistant MCrAlHf coatings were developed and evaluated for use on stainless and superalloy components in coal gasification process equipment. Alumina forming MCrAl coatings, where M is Co or Fe were found to be the best materials, having excellent resistance to attack by both high and low Btu gasification atmospheres with 1% H2S at 18000 F (12550 K). The optimum composition was found to be 18 to 25% Cr, 8 t 10% Al, bal. Co or Fe. The addition of 1% Hf promoted oxide spall resistance. These coatings can be applied by slurry or thermal spray process; however, they must be dense and have a uniform crack and pore-free structure. It is demonstrated that this can be accomplished by surface fusion with pulsed YAG or continuous CO2 lasers. The conditions required for laser surface fusion are within the capabilities of many commercial laser devices. DOE

N81-31351# Lockheed Missiles and Space Co., Palo Alto, Calif.
DEVELOPMENT OF COATINGS FOR CORROSION/EROSION PROTECTION OF INTERNAL COMPONENTS OF COAL GASIFICATION VESSELS. VOLUME 2: FURNACE FUSED MCrAl COATINGS Final Report, 1 Oct. 1977 - 1 Apr. 1980
R. A. Perkins, P. R. Clark, and C. M. Packer 15 Mar. 1981 129 p refs
(Contracts DE-AC01-77ET-10245; EF-77-C-01-2592)
(DOE/ET-10245/1-Vol-2) Avail: NTIS HC A07/MF A01

MCrAl coatings (where M is Fe, Ni, Co) are produced by melting and alloying coating powders on the surface of high temperature alloy substrates in a vacuum furnace. It was found that 33Cl-67Al and 33Cr-63Al-4Hf prealloyed powder mixtures fused into the surface of alloy 800 produced coatings that survived 2000 h at 18000 F (12550 K) in a low Btu coal gasification atmosphere with 1% H2S. The addition of refractory sulfide formers such as Ti, Cb, and Mo in he CrAlHf composition reduced resistance to oxidation and shortened coating life. The best coating is 33Cr-63Al-4Hf on alloy 800. Procedures for application of the coating are given and the effect of the coating and subsequent long time exposure to high sulfur low Btu coal gasification atmospheres on mechanical properties of the substrate is discussed. Factors that control performance and overall coating life are reviewed and recommendations for further development and evaluation of the coating are presented. A.R.H.

N81-31352# Rolls-Royce Ltd., Derby (England).
LIVING WITH DEFECTS IN POWDER METALLURGY MATERIALS
W. Betz (Motoren- und Turbinen-Union Muenchen G.m.b.H.) and W. Track (Motoren- und Turbinen-Union Muenchen G.m.b.H.) Dec. 1980 22 p refs Transl. into ENGLISH of 'Leben mit fehlern in pulvermetallurgischen Werkstoffen' In ENGLISH and GERMAN Presented at Powder Metallurgy Superalloys, a Metal Powder Rept. Conf., Zurich, 18-20 Nov. 1980
(PNR-90065; TRANS-15543; TLT-00819) Avail: NTIS HC A02/MF A01

Material defects due to embedded foreign particles in sintered turbine components are discussed. Remedies for the foreign body inclusion problem are examined: avoidance and removal of foreign particles in powder manufacturing, elimination of defective components by nondestructive tests, and establishing of limits of utilization once a guaranteed degree of purity is assumed. One effective method of limiting the importance of the defect is the establishing of a low limit for the maximum size of foreign particles. No method is found acceptable for nondestructive tests. A fracture mechanics representation of the crack propagation behavior and the Haigh diagram with lines of constant lives under the influence of defects are recommended for a quality control system. Author (ESA)

N81-31353# Defence Research Information Centre, Orpington (England).
THE EFFECTS OF TRACE ELEMENTS IN NICKEL CONTAINING STEELS AND ALLOYS
G. Mayer and C. A. Clark Mar. 1981 42 p refs Transl. into ENGLISH from Metall (West Germany), v. 29, no. 5, 1975 p 479-487
(DRIC-T-6345; BR78678) Avail: NTIS HC A03/MF A01

The literature pertaining to the undesirable effects of trace elements is reviewed. Certain trace elements such as S, As and low melting point metals containing only a few ppm up to 0.05 % may cause an impairment of the alloy properties, particularly with regard to hot and cold working characteristics. The problems caused by the various contaminants relative to the desired properties of the alloys are given as well as the minimum acceptable percentage of trace element. The recently introduced standards for pure nickel are debated. The development of special analytical techniques for the determination of trace elements in nickel and its alloys are discussed. Author (ESA)

N81-31354# Bureau of Mines, Albany, Oreg.
ELECTRIC-ARC FURNACE PROCESSING OF DOMESTIC TITANIFEROUS MATERIALS
R. H. Nafziger, R. R. Jordan, and W. L. Hunter Mar. 1981 43 p refs
(PB81-196727; BM-RI-8511) Avail: NTIS HC A03/MF A01 CSCL 11F

The Bureau of Mines evaluated 18 materials with widely varying compositions, mineralogy, and physical properties. Techniques were devised to recover both the titanium and iron values contained in these materials so that the reliance of the United States on foreign sources of higher grade ilmenties and rutile might be decreased. GRA

N81-31355# International Nickel Co., Inc., Suffern, N. Y.
AVAILABILITY OF CRITICAL SCRAP METALS CONTAINING CHROMIUM IN THE UNITED STATES. SUPERALLOYS AND CAST HEAT- AND CORROSION-RESISTANT ALLOYS
LeRoy R. Curwick, Walter A. Petersen, and Harry V. Makar (Bureau of Mines, Avondale, Md.) Washington, D. C. Bureau of Mines 1980 60 p refs
(Contract DI-BM-J0-188056)
(PB81-197147; BM-IC-8821) Avail: NTIS HC A04/MF A01 CSCL 11F

This Bureau of Mines report presents the results of a study conducted to assess the domestic availability of chromium from superalloy and cast heat and corrosion-resistant alloy scrap material. Six alloy classes included in this survey were investment cast, hardfacing, and wrought nickel- and cobalt-base alloys, wrought nickel-iron-base alloys, and heat- and corrosion-resistant alloy castings. Data were collected for 1976 on metallic scrap generation, use patterns, and production practices for these alloy producing and using industries. A model was developed that allowed an assessment of the materials flow circuits within the industries that produce these alloys. The types, amounts,

sources, secondary products, and ultimate destinations of chromium-containing metallic scrap for the six alloy classes were determined. GRA

N81-31356# Bureau of Mines, Twin Cities, Minn.
SELECTIVE EXTRACTION OF METALS FROM PACIFIC SEA NODULES WITH DISSOLVED SULFUR DIOXIDE
S. E. Khalafalla and J. E. Pahlman Mar. 1981 33 p refs
(PB81-197139; BM-RI-8518; RI-1981) Avail: NTIS HC A01/MF A01 CSCL 11F

The Bureau of Mines has investigated a hydrometallurgical system with sulfur dioxide. Differential leaching with dissolved SO2 of manganese, nickel, and cobalt from their hydrous oxides was found to be very rapid and efficient almost instaneous and quantitative. GRA

N81-31357# Bureau of Mines, Twin Cities, Minn.
METHOD FOR PREPARING FERROCHROMIUM ALLOYS BY VACUUM REDUCTION AND SIMPLE MELTING OF REDUCED PRODUCTS
J. E. Pahlman, M. L. Boucher, S. L. Payne, and S. E. Khalafalla Mar. 1981 28 p refs
(PB81-197196; BM-RI-8514; LC-80-607761) Avail: NTIS HC A03/MF A01 CSCL 11F

Reduced products containing less than 2 wt-pct C and as low as 0.01 wt-pt C were obtained by reacting pellets of chromite and carbonaceous reductant mixtures at pressures of 0.1 to 1 torr and temperatures of 1,230 C to 1,320 C. The extent of reduction increased with increased temperature and decreased pressure; however, operating conditions were limited due to the onset of significant chromium vaporization at higher temperatures and lower pressures. Foundry coke, anthracite, and carbon black were found to be superior to graphite as reductants. Buttons of ferrochrome alloys were made by melting a mixture of reduced products with CaO and SiO2 at 1,700 C for 20 minutes in an induction furnace. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N81-31358 Michigan State Univ., East Lansing.
THERMODYNAMICS AND DIFFUSION IN POLYMER SOLUTIONS CONTAINING ASSOCIATING SPECIES Ph.D. Thesis
Joe Su-Shien Lin 1980 165 p
Avail: Univ. Microfilms Order No. 8117251

A Mach-Zehnder diffusiometer was used to measure the diffusion coefficients of eight polymer solvent mixtures at 34.0 C. Osmotic pressures and osmotic second viral coefficients at 34.0 C were determined with a Hallikainen automatic membrane osmometer. Monodisperse polytetrahydrofurane with and without OH end groups were chosen for this work. Two solvents (bromobenzene and methyl-ethyl-ketone) having different capability for blocking the formation of hydrogen bonds were employed to study the solvent influence upon association behavior. The results indicate that the OH end groups indeed affect thermodynamic and diffusion properties of dilute polymer solutions significantly. Data from this work as well as from the literature are used to test the validity of the association model with good results. Dissert. Abstr.

N81-31359 Ohio Univ., Athens.
MODIFICATION OF POLYSTYRENE WITH SOME NAPHTHYRIDINES TO AFFORD METAL BONDING SITES Ph.D. Thesis
Nestor S. Velera 1981 103 p
Avail: Univ. Microfilms Order No. 8115771

The ligands 1,8-naphthyridine (NAPY), 1,8-naphthyridine-N-oxide (NAPYNO), 1,5-naphthyridine (1,5-NAPY), and pyrido [2,3-B] prazine (PPZ) were attached to the free phenyl residues of insoluble polystyrene-2% divinylbenzene (PS-2%DVB)copolymer beads via the bromination-lithiation pathway. A number of metal ions were coordinated to the functionalized polymers to demonstrate the versatility of the polymerbound ligands. Elemental analyses, metal loading, and diffuse reflectance infrared data were applied to the characterization of these polymers and their respective polymer bound metal derivatives. The presence of ligand vibrational modes in the diffuse reflectance spectra of all polymers confirms the existence of bound ligands. The loading capacities of these polymers toward the nitrate, chloride, and tetrafluoroborate salts of copper(II) were determined. Metal carbonyl derivatives of Cr(0),Mo(0), and W(0) were synthesized via thermal reactions of poly(styryl-1,8-naphthyridine) and the respective Group VIv metal hexacarbonyls. The bound carbonyl derivatives were characterized by metal analyses and infrared spectral data. Dissert. Abstr.

N81-31360*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECT OF ELASTOMER CHAIN LENGTH ON PROPERTIES OF SILICONE-MODIFIED POLYIMIDE ADHESIVES
Anne K. St.Clair, Terry L. St.Clair, and Stephen Ezzell Aug. 1981 14 p refs Proposed for presentation at the 33rd Southeastern Regional Meeting of the Am. Chem. Soc., Lexington, Ky., 4-6 Nov. 1981
(NASA-TM-83172) Avail: NTIS HC A02/MF A01 CSCL 11A

A series of polyimides containing silicone elastomers was synthesized in order to study the effects of the elastomer chain length on polymer properties. The elastomer with repeat units varying from n=10 to 105 was chemically reacted into the backbone of an addition polyimide oligomer via reactive aromatic amine groups. Glass transition temperatures of the elastomer and polyimide phases were observed by torsional braid analysis. The elastomer-modified polyimides were tested as adhesives for bonding titanium in order to determine their potential for aerospace applications. Adhesive lap shear tests were performed before and after aging bonded specimens at elevated temperatures. Author

N81-31361*# Grumman Aerospace Corp., Bethpage, N.Y.
HYBRIDIZED POLYMER MATRIX COMPOSITES Contractor Final Report, Jun. 1978 - Jun. 1980
Arnold London Jul. 1981 113 p refs
(Contract NAS3-21382)
(NASA-CR-165339) Avail: NTIS HC A06/MF A01 CSCL 11G

Design approaches and materials are described from which are fabricated pyrostatic graphite/epoxy (Gr/Ep) laminates that show improved retention of graphite particulates when subjected to burning. Sixteen hybridized plus two standard Gr/Ep laminates were designed, fabricated, and tested in an effort to eliminate the release of carbon (graphite) fiber particles from burned/burning, mechanically disturbed samples. The term pyrostatic is defined as meaning mechanically intact in the presence of fire. Graphite particulate retentive laminates were constructed whose constituent materials, cost of fabrication, and physical and mechanical properties were not significantly different from existing Gr/Ep composites. All but one laminate (a Celion graphite/bismaleimide polyimide) were based on an off-the-shelf Gr/Ep, the AS-1/3501-5A system. Of the 16 candidates studied, four thin (10-ply) and four thick (50-ply) hybridized composites are recommended. S.F.

N81-31362*# Bowie State Coll., Md.
CHARACTERIZATION OF THE PHYSICO-CHEMICAL PROPERTIES OF POLYMERIC MATERIALS FOR AEROSPACE FLIGHT Semiannual Report
Michael Rock and Sher Z. Khan 2 Sep. 1980 68 p refs
(Grant NsG-5009)
(NASA-CR-160070) Avail: NTIS HC A04/MF A01 CSCL 11G

Factors contributing to the final failure of Ni-Cd batteries are listed. A differential thermal analyzer was used to study several positive and negative battery electrodes. The negative plates show a very large peak (endotherm) between 245 C and 250C. The second endotherm occurs at 300C indicating the decomposition of Cd(OH)2. In positive plates, a first weak endotherm occurs at 100C, which indicates loss of H2O from Ni(OH)2(H2O)n molecules. A second large endotherm occurs in the range of 290C to 300C, indicating the decomposition of

Ni(OH2) to NiO and H2O. Atomic absorption spectroscopy was used to determine nickel, cobalt, cadmium, and potassium content in battery electrolytes and electrodes. Results are presented in tables. A.R.H.

N81-31363*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RESIN COMPOSITION, PROCESS FOR PRODUCING THE SAME, PRODUCT PRODUCED THEREFROM AND PROCESS FOR PRODUCING SAID PRODUCT Patent Application
Demetrius A. Kourtides and John A. Parker, inventors (to NASA) Filed 30 Jul. 1981 24 p
(NASA-Case-ARC-11331-1; US-Patent-Appl-SN-288279) Avail: NTIS HC A02/MF A01 CSCL 07C

Flame and temperature resistant fiber reinforced panels are prepared by thermally curing, optionally in the presence of a thermal cure accelerating catalyst, a composition comprising a blend of diglycidyl ether or bis-(4-hydroxyhenyl)-fluorene, a novel compound, and diglycidyl ether of bisphenol A. Suitable catalysts are trimethoxyboroxine and ethyl triphenyl phosphonium iodide. The resin blend composition is simply thermally cured at temperatures of 149 C to 216 C, optionally in the presence of the catalyst which accelerates thermal curing, to produce a resin molding. The resin blend composition can also be used to impregnate reinforcing fibers such as glass cloth and graphite cloth to produce prepregs, and laminates of assemblies of these prepregs can be then cured under heat and pressure to produce reinforced composites suitable as panels in buildings, aircraft and ships. NASA

N81-31364*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHOSPHORUS-CONTAINING IMIDE RESINS Patent Application
Indra K. Varma (NAS-NRC, Washington, D.C.), George M. Fohlen, and John A. Parker, inventors (to NASA) Filed 30 Jul. 1981 16 p
(NASA-Case-ARC-11368-1; US-Patent-Appl-SN-288267) Avail: NTIS HC A02/MF A01 CSCL 07C

Bis- and tris-imides derived from tris (m-aminophenyl) phosphine oxides by reaction with maleic anhydride or its derivatives, and addition polymers of such imides, including a variant in which a mono-imide is condensed with a dianhydride and the product is treated with a further quantity of maleic anhydride. Such monomers or their oligomers may be used to impregnate fibers and fabrics which when cured, are flame resistant. Also an improved method of producing tris (m-aminophenyl) phosphine oxides from the nitro analogues by reduction with hydrazine hydrate using palladized charcoal or Raney nickel as the catalyst is described. NASA

N81-31365*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF SILANE-HYDROLYSATE BINDER FOR UV-RESISTANT THERMAL CONTROL COATINGS
W. J. Patterson Aug. 1981 23 p refs Original contains color illustrations
(NASA-TP-1900; M-353) Avail: NTIS HC A02/MF A01 CSCL 11G

Detailed characterizaton and formulation studies were performed on a methyltriakoxysilane hydrolysate as a binder for thermal control coatings. The binder was optimized by varying hydrolysis temperature, time, catalyst type, and water concentration. The candidate coating formulations, based on this binder with TiO2 pigment, were optimized via a detailed series of sprayed test panels that included the parameters of binder/pigment ratio, ethanol content, pigment particle size, coating thickness and cure conditions. A typical optimized coating was prepared by acetic acid catalyzed hydrolysis of methyltriethoxysilane with 3.25 mol-equivalents of water over a 24 hour period at room temperature. The resulting hydrolysate was directly mixed with pre-milled TiO2 (12 grams pigment/26 grams binder) to yield a sprayable consistency. Panels were sprayed to result in a nominal cure coating thickness of 2 mils. Cure was affected by air drying for 24 hr at room temperature plus 72 hr at 150 F. These coatings are typically extremely tough and abrasion-resistant, with an absorptance (alpha) of 0.20 and emittance (e) of 0.89. No significant coating damage was observed in the mandrel bend test, even after exposure to thermal cycling from -160 to 160 F. Vacuum exposure of the coatings for 930 hours at 1 equivalent UV sun resulted in no visible degradation and no significant increase in absorptance. Author

N81-31366*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF YTTRIA ADDITIVES ON PROPERTIES OF PRESSURELESS-SINTERED SILICON NITRIDE
Alan Arias Sep. 1981 11 p refs
(NASA-TP-1899; E-751) Avail: NTIS HC A02/MF A01 CSCL 11G

Si3N4-base ceramics were made from milled Si3N4 containing 11.1 wt% SiO2 and oxide additives by pressureless sintering at 1760 C. The four-point-average moduli of rupture were 460, 515, and 515 MPa at room temperature and 270, 256, and 227 MPa at 1400 C for compositions with 3.67, 7.22, and 14.0 wt% Y2O3, respectively. The oxidation resistance of these compositions decreased with increasing Y2O3 in the 600 to 1400 C range, and no surface oxide cracking or spalling was noted. Partial substitution of Al2O3 for Y2O3 reduced both strength and oxidation resistance. Author

N81-31367# IBM Research Lab., San Jose, Calif.
POLY (P-PHENYLENE SULFIDE) HEXAFLUOROARSENATE: A NOVEL CONDUCTING POLYMER
T. C. Clarke, K. K. Kanazawa, V. Y. Lee, J. F. Rabolt, and J. R. Reynolds 28 Jul. 1981 26 p refs Submitted for publication (Contract N00014-80-C-0779)
(AD-A102290; TR-1) Avail: NTIS HC A03/MF A01 CSCL 11/9

Poly(p-phenylene sulfide) (PPS) is a melt and solution processible polymer which on treatment with AsF5 forms a blue-black material with a conductivity of 1 to 10/ohm cm. Thermopower measurements indicate that the resulting polymer is p-type, consistent with partial oxidation of the PPS by the AsF5. The rate and extent of this doping process prove to be particularly sensitive to the degree of crystallinity of the starting polymer. There is no evidence of crosslinking of the polymer chains during the reaction with AsF5. The details of both the chemistry and physics of the doping of PPS and several of its derivatives are presented. Author (GRA)

N81-31368# IBM Research Lab., San Jose, Calif.
ELECTRICAL PROPERTIES OF PYRROLE AND ITS COPOLYMERS
K. K. Kanazawa, A. F. Diaz, M. T. Krounbi, and G. B. Street 28 Jul. 1981 23 p refs Submitted for publication (Contract N00014-80-C-0779)
(AD-A102292; TR-3) Avail: NTIS HC A02/MF A01 CSCL 11/9

Electrochemically prepared polypyrrole film have metallic conductivities in the range 40-100/Scm whereas poly-N-methyl pyrrole films have conductivities more typical of a semiconductor approx. .001/Scm. Films made by the electrochemical polymerization of mixtures of pyrrole and N-methylpyrrole have redox potentials intermediate between those of either monomer indicating that they are in fact random copolymers. The electrical conductivity and thermopower measured as a function of copolymer composition show no evidence for an abrupt metal-semiconductor transition. All these polymers are stable in air to temperatures in excess of 100 C. Author (GRA)

N81-31369# IBM Research Lab., San Jose, Calif.
PHOTOINITIATED DOPING OF POLYACETYLENE
T. C. Clarke, M. T. Krounbi, V. Y. Lee, and G. B. Street 28 Jul. 1981 7 p refs Submitted for publication (Contract N00014-80-C-0779)
(AD-A102291; TR-2) Avail: NTIS HC A02/MF A01 CSCL 11/9

Ultraviolet irradiation of polyacetylene films treated with diaryliodonium or triarylsulfonium salts leads to doping of the exposed areas and provides greater control of the doping process than can be achieved by conventional doping methods. Author (GRA)

N81-31370# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.

STRUCTURE AND PROPERTIES OF POLYMERS AND ORGANOSILANES ABSORBED ONTO OXIDIZED ALUMINUM AND TITANIUM Interim Report, 1 Jul. 1980 - 30 Jun. 1981

F. James Boerio 1 Jul. 1981 56 p refs

(Contract N00014-80-C-0733; NR Proj. 039-202)

(AD-A102365) Avail: NTIS HC A04/MF A01 CSCL 13/8

The structure of films formed by organofunctional silanes adsorbed onto aluminum, titanium, and iron mirrors from aqueous solutions was related to the effectiveness of the silanes as primers for improving the wet strength of metal-to-metal adhesive joints made from the same metals. Gamma-aminopropyltrieth-oxysilane (gamma-APS) formed smooth, continuous polysiloxane films when adsorbed onto iron from aqueous solutions at pH 8.0. Such films were extremely effective primers. Lap joints prepared from iron adherends primed with gamma-APS at pH 8.0 retained about 70% of their original strength after 60 days immersion in water at 60C while joints prepared from unprimed adherends retained only 25% of their strength. Gamma-APS was less effective when applied to iron adherends at pH 10.4 but lap joints prepared from such adherends still retained 50% of their strength after 60 days in water at 60C. Gamma-glycidoxypropyltrimethoxysilane (Gamma-GPS) formed polysiloxane films that were effective primers when adsorbed onto iron from aqueous solutions containing an acid to catalyze hydrolysis of the silane. The environmental failure of iron/epoxy lap joints was consistent with a model suggesting debonding of the adhesive a certain distance into the joint when a critical concentration of water was obtained that same distance into the joint. GRA

N81-31371# Battelle Columbus Labs., Ohio.

OPERATION OF THE METALS AND CERAMICS INFORMATION CENTER Annual Report, 1 May 1980 - 30 Apr. 1981

Harold Mindlin and J. F. Lynch Watertown, Mass. Army Materials and Mechanics Research Center Jul. 1981 60 p

(Contract DLA900-78-C-1715)

(AD-A102212; AMMRC-TR-81-33; QPR-12) Avail: NTIS HC A04/MF A01 CSCL 11/2

This report reviews the continuing operations and development of the Metals and Ceramics Information Center for the period of May 1, 1980 through April 30, 1981. Activity and growth of the Center are discussed in terms of the major work areas: Information, Operations, Products and Services, Service-Charge Program, Marketing, and Management. Future plans for the Center also are included. Author (GRA)

N81-31372# Rockwell International Science Center, Thousand Oaks, Calif.

HIGH TEMPERATURE MECHANICAL PROPERTIES OF POLYPHASE CERAMICS BASED ON SILICON NITRIDE Final Report, 1 Feb. 1977 - 31 Jan. 1981

F. F. Lange, D. R. Clarke, and B. I. Davis Apr. 1981 91 p refs

(Contract F49620-77-C-0072; AF Proj. 2306)

(AD-A102121; SC5099.4FR; AFOSR-81-0555TR) Avail: NTIS HC A05/MF A01 CSCL 11/2

Results for the four year effort concerning the high temperature mechanical properties of polyphase ceramics based on Si3N4 are described. Initial work showed that subcritical crack growth at high temperature was caused by cavitation. Phase equilibria work identified the lowest melting eutectic in the Si3N4-Mg2SiO4-MgO portion of the Si-Mg-O-N system and linked the volume fraction of the residual glassy phase to material composition. Subsequent creep studies related creep mechanism to composition through the volume fraction of the glassy phase. Creep resistance was observed to increase after a pre-oxidation treatment. Other work at Rockwell International Science Center showed that oxidation produced compositional changes and that the detrimental glassy phase was a fugitive of oxidation. Recent work culminated this study to show that the high temperature strength of polyphase Si3N4 could be at least doubled through compositional changes induced by oxidation. Author (GRA)

N81-31373# Department of Energy, Bartlesville, Okla.

POLYACRYLAMIDE POLYMER VISCOSITY AS A FUNCTION OF BRINE COMPOSITION

T. R. French, Nathan Stacy, and A. G. Collins May 1981 17 p refs

(DOE/BETC/RI-80/12) Avail: NTIS HC A02/MF A01

A computer model was developed which predicts the viscosity of polymer and oil field brine mixtures. The polymers used were Amoco-Sweepaid 103 and Dow-Pusher 500 polyacrylamide polymers. All of the experiments were conducted at 1200 ppM polymer concentration. The computer input consisted of the ionic strength of the brine in the mixture and the fraction of that ionic strength due to sodium ions. The computer program made predictions of viscosity by referencing a family of viscosity curves for various mixtures of sodium chloride and calcium chloride in 1200 ppM polymer solutions. The model was tested using 50 mixtures of brines and polymers. The ionic strength of the brine in the mixtures varied from 0.0018 to 0.025. The fraction of the brines total ionic strength due to sodium ions varied from 0.22 to 0.49. The brines consisted predominantly of sodium, potassium, magnesium, calcium, chloride, bicarbonate and sulfate ions. DOE

N81-31374# Sandia Labs., Albuquerque, N. Mex.

AGING CHARACTERISTICS OF THE SA1773 CERAMIC CAPACITOR

Thomas J. Young Jan. 1981 18 p

(Contract DE-AC04-76DP-00789)

(SAND-80-1132) Avail: NTIS HC A02/MF A01

The SA1773 ceramic capacitor, which may be used in applications requiring a continuously applied dc voltage for long periods of is described. Preliminary data relative to leakage current and capacitance aging characteristics of the SA1773 are reported. The range of temperatures, voltages, and times in the preliminary experiments were 75 to 1750C, 500 V to 2500 V, and times to 1811 days. An empirical model is described which allows for the estimation of leakage current as a function of voltage, temperature, and time. DOE

N81-31375# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.

THERMAL DIFFUSIVITIES OF MOLYBDENUM/ALUMINA CERMETS

H. Craig Miller 19 Jun. 1981 13 p refs

(Contract DE-AC04-76DP-00656)

(GEPP-TIS-472) Avail: NTIS HC A02/MF A01

The thermal diffusivities of several molybdenum/alumina cermets were measured using a transient heat flow, semi-infinite plate method. The cermets had thermal diffusivities significantly greater than those of a 94% Al2O3 alumina. A 50/50 wt% cermet had a thermal diffusivity of 0.102 sq cm/s at 3130K, while the alumina had a value of 0.067 sq cm/s. DOE

N81-31376# Deutsche Gesellschaft fuer Mineraloelwissenschaft und Kohlechemie e.V., Hamburg (West Germany). Anwendungstechnik.

AIR UPTAKE AND AIR RELEASE BEHAVIOR OF LUBRICATING OILS AND HYDRAULIC FLUIDS

L. Doellinger, A. Gerve, and H. Vogg Apr. 1980 175 p refs In GERMAN; ENGLISH summary

(DGMK-31) Avail: NTIS HC A08/MF A01

It is noted that aeration and deaeration (AD) are of particular interest for lubricating oils and hydraulic fluids as dispersed air not only alters various fluid properties which are essential for engine operation, but also influences operational noise, aging of fluid, and wear characteristics. For measuring AD as a function of various parameters two units for air content measurement and a photographic bubble size measuring unit were developed. Test results indicate that the aeration behavior is determined by type, properties and doping of the fluid as well as by the air flow rate and the nozzle diameter used for dispersing. Deaeration is determined by type, properties and doping of the fluid as well as by the bubble size distribution produced during dispersing. An explanation for the above parametric dependences is also given. Author (ESA)

N81-31377# DSM/nv Nederlandse Staatsmijnen, Geleen. Central Lab.

MEASUREMENT OF THERMODYNAMIC QUANTITIES OF POLYMER SYSTEMS

H. M. Onclin (Antwerp Univ.) and R. Koningsveld 1980 5 p

refs In DUTCH
(MS-1240) Avail: NTIS HC A02/MF A01

A series of experimental techniques used to quantify the miscibility of polymers are discussed. Starting from a thermodynamic consideration of the free energy of binary systems of polymers, three methods are elucidated. These are: (1) determination of the stability boundary or spinodal of the system by means of light scattering or pulse induced critical scattering; (2) finding the critical point of a mixture of low molecular polymers by static means or by centrifugal means in the case of viscous mixtures; and (3) measurement of the flake point, from the opacity or by centrifugal phase separation. Author (ESA)

N81-31378# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Kryo-Kanal.
UNSTEADY THERMAL STRESS ANALYSIS OF A CRYOGENIC FOAM INSULATION ELEMENT
Bela Palancz and Berthold Schaefer Mar. 1981 54 p refs
(DFVLR-FB-81-17) Avail: NTIS HC A01/MF A01

The unsteady temperature and the accompanying deformation and stress fields in a cryogenic foam element of polyurethane and polystyrene were simulated numerically. The model, based upon the minimum potential energy method, was compared with the standard computer code STARDYNE. The joint heat-transfer problem is considered with a fourth kind boundary condition. The very weak interaction between the temperature and deformation fields is neglected. The temperature dependence of both of the physical and mechanical properties of the insulation element are taken into consideration. The difference between the numerical results was within 10 percent and the simplified method used five times less CPU time than the STARDYNE code. The results of the structure crack analysis carried out on the basis of the computed stress field show that the dynamical change of the temperature in the element (cool down) can be more dangerous than the steady-state (cooled down state).
Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N81-31379 Rice Univ., Houston, Tex.
CONVERSION OF METHANOL AND LIGHT OLEFINS TO GASOLINE OVER A SHAPE SELECTIVE CATALYST ZSM-5 Ph.D. Thesis
Frank Shaw-Shyong Hwu 1981 154 p
Avail: Univ. Microfilms Order No. 8116969

The product distribution over a broad range of space velocities indicates the reaction sequence: methanol reversible reaction dimethyl and ether yields C2-C5 olefins yields parafins and aromatics. Monomethyl aliphatics predominate over both straight-chain and dimethyl hydrocarbons. Aromatics consist mainly of toluene and xylene mixtures. At 368 C, compositions of butene isomers are in thermodynamic equilibrium, over the range of residence times investigated. Equilibrium composition of xylenes is not established until tau = 1440 mg-sec/cc; p-xylene is kinetically favored at short residence. Dissert. Abstr.

N81-31380*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFRARED SPECTROSCOPY FOR THE DETERMINATION OF HYDROCARBON TYPES IN JET FUELS
Constance S. Buchar Aug. 1981 10 p refs
(NASA-TM-82674; E-957) Avail: NTIS HC A02/MF A01 CSCL 21D

The concentration of hydrocarbon types in conventional jet fuels and synfuels can be measured using a computerized infrared spectrophotometer. The computerized spectrophotometer is calibrated using a fuel of known aromatic and olefinic content. Once calibration is completed, other fuels can be rapidly analyzed using an analytical program built into the computer. The concentration of saturates can be calculated as 100 percent minus the sum of the aromatic and olefinic concentrations. The analysis of a number of jet fuels produced an average standard deviation of 1.76 percent for aromatic types and one of 3.99 percent for olefinic types. Other substances such as oils and organic mixtures can be analyzed for their hydrocarbon content. Author

N81-31381# Committee on Commerce, Science, and Transportation (U. S. Senate).
METHANE TRANSPORTATION RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT OF 1980
Washington GPO 1980 165 p refs Joint Hearing on H.R. 6889 before the Subcomm. on Energy Res. and Develop. of the Comm. on Energy and Nat. Resources and the Subcomm. on Sci., Technol., and Space of the Comm. on Com. Sci., and Transportation, 96th Congr., 2nd Sess., 23 Sep. 1980
(Publ-96-126; GPO-70-504) Avail: NTIS Avail: Subcommittee on Energy Research and Development

A bill is presented which would provide a program for advanced and accelerated research into methane vehicle design, methane distribution systems, and methane storage facilities. It would also demonstrate the economic and technological practicalities of methane fueled vehicles for fleet use and onfarm operations. The Department of Energy would be the lead agency to conduct this research, development, and demonstration program. The bill would result in the initiation of 50 fleet demonstrations, of no less than 50 vehicles each, over the next 3 years. R.C.T.

N81-31382# Committee on Banking, Finance and Urban Affairs (U. S. House).
SYNTHETIC FUEL OVERSIGHT HEARING
Washington GPO 1981 99 p Hearing before the Subcomm. on Econ. Stabilization of the Comm. on Banking, Finance and Urban Affairs, 97th Congr., 1st Sess., 3 Mar. 1981
(GPO-76-079) Avail: Subcommittee on Economic Stabilization

Current programs in the development of synthetic fuel technology and supplies are described. Emphasis is placed on rapid development to ensure greater independence from foreign energy supplies. Progress in coal liquefaction, coal gasification, and oil recovery, is discussed in relationship to the synthetic fuels programs. T.M.

N81-31383# Committee on Commerce, Science, and Transportation (U. S. Senate).
ENERGY FROM OPEN OCEAN KELP FARMS
Washington GPO 1980 87 p refs Presented to the Comm. on Com., Sci., and Transportation, 96th Congr., 1st Sess., Sep. 1980 Prepared by Office of Technology Assessments
(GPO-51-285) Avail: Committee on Commerce, Science, and Transportation

The problems and opportunities associated with developing ocean farms which would use giant kelp as a biomass source of energy are described. The possibilities of kelp are examined in terms of the status of the technology in general, its potential, the problems involved, and the Federal role in this segment of altenative energy research. R.C.T.

N81-31384# Committee on Agriculture (U. S. House).
ALCOHOL FUELS
Washington GPO 1980 109 p refs Joint hearings before the Comm. on Sci. and Technol. and the Comm. on Agr., 96th Congr., 2nd Sess., No. 176, 2 Oct. 1980
(GPO-70-454) Avail: Committee on Science and Technology

The plans of DOE and USDA to implement a major program for the production of alcohol fuels from biomass energy resources are examined. Emphasis is placed on the effect of such conversion technology on the food supply. Specific factors considered include regional feedstocks based on surpluses and/or wastes, cogeneration projects, and cellulosic conversion and utilization of agricultural wastes and residues for methane production. J.M.S.

N81-31385# Committee on Energy and Natural Resources (U.S. Senate).
SYNFUELS FROM COAL AND THE NATIONAL SYNFUELS PRODUCTION PROGRAM: TECHNICAL, ENVIRONMENTAL, AND ECONOMIC ASPECTS

Paul F. Rothberg, John R. Justus, James E. Mielke, F. Angelyn Wells, Judith A. Katzoff, Robert E. Trumbule, Malcolm M. Simmons, Alvin Kaufman, and Susan J. Bodilly Washington GPO 1981 312 p refs Presented to the Comm. on Energy and Nat. Resources, 9th Congr., 1st Sess., Jan. 1981 Prepared by the Congressional Research Service, Library of Congress
(GPO-71-047; Publ-97-3) Avail: SOD HC

The regulatory framework associated with the emerging coal-based synthetic fuels (synfuels) industry was examined. Federal programs affecting the commercialization of this industry were reviewed and analyzed, and areas for possible congressional oversight and additional action are indicated. The Federal programs are an interim program and a long range program. The interim program can be divided into the Department of Energy's (DOE) Alternative Fuels Production Program, and a joint DOE-Department of Defense (DOD) program which allows funding for synfuels projects under amendments to the Defense Production Act. The long range program will be conducted by the United States Synthetic Fuels Corporation (SFC), an independent Federal entity which will function primarily as an investment bank to accelerate the commercialization of synfuels. DOE

N81-31386# Illinois Univ. at Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.
SHOCK DEVELOPMENT AND TRANSITION TO DETONATION INITIATED BY BURNING IN POROUS PROPELLANT BEDS Interim Report
P. Barry Butler and Herman Krier Feb. 1981 106 p refs
(Grant AF-AFOSR-3336-77; AF Proj. 2308)
(AD-A102030; AAE-81-1; UILU-ENG-81-0501; AFOSR-81-0584TR) Avail: NTIS HC A06/MF A01 CSCL 21/8

This report summarizes the analyses of deflagration to detonation transition (DDT) occurring in a packed bed of granular, high energy solid propellant. A reactive two-phase flow model of this phenomena is solved by utilizing a Lax-Wendroff finite differencing technique. A brief overview of the well-known shock jump conditions for one-dimensional, one-phase flow with heat addition is reported, and a similar analysis for one-dimensional, two-phase reactive flow is discussed. Improvements made in the gas phase nonideal equation of state, gas permeability, and numerical integration techniques allow for the prediction of a transition to a steady detonation from initiation by deflagration. Analyses are presented that clearly indicate the effect of the propellant physical and chemical parameters on the predicted run-up length to detonation. Predictions of this run-up length to detonation are presented as a function of propellant chemical energy, burning rate, bed porosity, and granulation (size). Limited comparison with actual DDT data in the literature indicates good qualitative agreement with these predictions. Author (GRA)

N81-31387# Michigan Univ., Ann Arbor. Gas Dynamics Labs.
DETONATION CHARACTERISTICS OF DUST DISPERSED IN AIR Annual Report, 1 Mar. 1980 - 1 Mar. 1981
C. W. Kauffman, J. A. Nicholls, M. Sichel, D. R. Glass, and D. Purmort May 1981 19 p refs
(Grant AF-AFOSR-0093-79; AF Proj. 2308)
(AD-A102507; UM-016968-2; AFOSR-81-0595TR) Avail: NTIS HC A02/MF A01 CSCL 19/1

This study is aimed at determining, experimentally and analytically, the detonation properties of high explosive dust when dispersed in air. The experimental facility, which is a modified form of a shock tube, is described. The experimental results obtained when a strong blast wave is transmitted into plastic coated RDX-air, RDX-nitrogen, and RDX-oxygen mixtures are described. Two sizes of particles were tested and the larger (about 150 micrometers) appeared to be easier to detonate than the smaller particles (about 10 micrometers). Ignition was observed in nitrogen but only after a long time delay. Calculated values of the detonation properties of RDX-air and various RDX-liquid fuel combinations in air are presented. The results of a numerical code prediction of the variation of pressure with distance behind the blast wave, as well as the structure of the detonation wave, are also presented. GRA

N81-31388# Naval Research Lab., Washington, D. C.
MEASUREMENTS OF THE SIZE DISTRIBUTION AND SOLUBILITY OF SALTY DOG PYROTECHNIC
W. A. Hoppel and T. A. Wojciechowski 7 Aug. 1981 21 p refs
(WR02402001)
(AD-A102547; NRL-MR-4578) Avail: NTIS HC A02/MF A01 CSCL 07/4

A laboratory experiment was undertaken to measure the size distribution and solubility of pyrotechnically generated hygroscopic aerosols (Salty Dog Aerosol). The results showed that all particles had dry sizes larger than 0.2 micron with the maximum number occurring in the size range between 0.25 and 0.50 micron radius. The solubility factor B was measured for particles in the size range of 0.20 to 0.26 micron found to be 0.20. GRA

N81-31389# Exxon Research and Engineering Co., Florham Park, N.J.
EDS COAL LIQUEFACTION PROCESS DEVELOPMENT, PHASE 4. CONSTRUCTION OF EXXON COAL LIQUEFACTION PILOT PLANT Final Report
Mar. 1981 160 p Sponsored in part by DOE, Exxon Co., EPRI, Japan Coal Liquefaction Development Co., Phillips Coal Co., ARCO Coal Co., Ruhrkohle AG, and Agip S.P.A.
(Contract DE-AB01-77ET-10069)
(DOE/ET-10069/T4; FE-2893-66) Avail: NTIS HC A08/MF A01

Completion of the Exxon Coal Liquefaction Pilot Plant Program began in 1975 is detailed. The final cost of the plant was an increase of 7.3 percent over the original cost outlook. DOE

N81-31390# United Technologies Research Center, East Hartford, Conn.
EVOLUTION OF FUEL NITROGEN DURING THE VACUUM THERMAL DEVOLATILIZATION OF COAL
J. D. Freihaut and D. J. Seery 1981 18 p refs
(Contract DE-AC21-78ET-10744)
(DOE/ET-10744/T3) Avail: NTIS HC A02/MF A01

The results of an investigation of the evolution of fuel nitrogen during the vacuum thermal decomposition of coal are presented. Results are shown for variations with coal characteristics and apparent thermal history. Apparent heating rates of 75 C/sec to 2000 C/sec and final temperatures of 500 C to 1780 C were utilized. a variety of coals were investigated ranging in rank from lignite to anthracite. The results indicate that nitrogen distribution in the volatiles is a sensitive function of the chemical characteristics of the parent coal. This distribution of nitrogen in the light gas, tar and char products of vacuum devolatilized coal is highly dependent on rank of the parent coal. Variations in nitrogen evolution with coal characteristics are most readily apparent in several aspects: (1) the coal nitrogen released with the tar species; (2) the release of nitrogen contained in primary tars as HCN upon secondary thermal decomposition reactions of the primary tars; and (3) the retention of nitrogen in the char species. DOE

N81-31391# Auburn Univ., Ala.
ROLE OF NON-FERROUS COAL MINERALS AND BY-PRODUCT METALLIC WASTES IN COAL LIQUEFACTION
D. Garg, F. K. Schweighardt, E. N. Givens, J. H. Clinton, A. R. Tarrer, J. A. Guin, C. W. Curtis, and S. M. Huang Jun. 1980 110 p Prepared in cooperation with Air Products and Chemicals, Inc., Trexlertown, Pa.
(Contract DE-AC22-79ET-14806)
(DOE/ET-14806/T4) Avail: NTIS HC A06/MF A01

The thermal behavior of various minerals and metallic by product wastes was evaluated by thermal gravimetric analysis and differential thermal analysis in the presence of hydrogen, nitrogen, and air. A number of minerals were screened for catalytic activity toward coal liquefaction in a tubing bomb reactor. The catalytic activity of the minerals was assessed by comparing the product distributions both in the presence of minerals and their absence. The use of a Bronson Sonifier was initiated in March to accelerate and improve the solvent separation technique. The addition of lime to the reaction mixture practically killed the liquefaction reaction. The addition of dolomite, rutile, illite, quartz, zircon, and calcite to the reaction mixture showed no signicant improvement over that of a no additive run. The addition of zinc oxide and ilmenite showed slight improvement. Robena

pyrite and Co-Mo-Al showed significant improvment in coal conversion and production of benzene solubles and gases. Iron oxide (Fe2O3) gave the highest conversion of coal and production of benzene solubles among all the minerals tested. DOE

N81-31392# Southwest Research Inst., San Antonio, Tex. Mobile Energy Div.
OPTIMIZATION OF ACCELERATED STABILITY-TEST TECHNIQUES FOR DIESEL FUELS Final Report
Leo L. Stavinoha and Steven R. Westbrook Jun. 1981 68 p refs
(Contract DE-AC19-79BC-10043)
(DOE/BC-10043/25) Avail: NTIS HC A04/MF A01

The formation of deleterious products in middle distillate fuels was studied. The results were applied to the development of more reliable test methods for fuel stability. Eight accelerated stability tests were chosen and evaluated using a set of six test fuels. Correlations of accelerated stability test results were then related to test results obtained at a storage temperature of 430 C (1100 F), which is generally regarded as showing good correlation with long-term ambient storage. Testing of eight fuels having a wide range of stabilities provided data which, when mathematically correlated, allowed for a number of observations. Total insolubles, as opposed to total gum values, were judged to be more acceptable for data correlation in that total gum values could not be reliably corrected for initial gum values.DOE

N81-31393# Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.
DEVELOPMENT OF GEOTHERMALLY ASSISTED PROCESS FOR PRODUCTION OF LIQUID FUELS AND CHEMICALS FROM WHEAT STRAW
V. G. Murphy, J. C. Linden, A. R. Moreira, and T. G. Lenz Jun. 1981 61 p refs Prepared for Edgerton Germeshausen and Grier, Idaho Falls, Idaho
(Contract DE-AS07-79ID-12051)
(DOE/ID-12051/T1) Avail: NTIS HC A04/MF A01

The effects of variations in autohydrolysis conditions on the production of fermentable sugars from wheat straw are investigated. Both the direct production of sugar from the autohydrolysis of hemicellulose and the subsequent yield from the enzymatic hydrolysis of cellulose are considered. The principal parameters studied were time, temperature, and water/fiber weight ratio; however, the effects of adding minor amounts of phenol and aluminum sulfate to the autohydrolysis charge were also investigated. A brief study was made of the effects of two major parameters, substrate concentration and enzyme/substrate ratio, on the sugar yield from enzymatic hydrolysis of optimally pretreated straw. The efficiency with which these sugars could be fermented to ethanol was studied. DOE

N81-31394# Dynatech R/D Co., Cambridge, Mass.
ENGINEERING ECONOMIC ANALYSIS OF BIOMETHANATION OF PYROLYSIS GAS
Jun. 1981 250 p refs
(Contract DE-AC01-78CS-20098)
(DOE/CE-20098/1) Avail: NTIS HC A11/MF A01

A detailed engineering economic analysis was carried out for the biomethanation of pyrolysis gas produced from municipal solid waste by the PUROX process. Biomethanation is defined in this analysis as the shift conversion of CO to CO2 and H2 and the methanation of CO2 and H2 by select anaerobic microorganisms. The biological reactions occur in the liquid phase of the reactor. A model of the biomethanation process was developed, incorporating material and energy balances, biological reaction kinetics, mass transfer rates, capital and operating costs, and utility financing cost analysis. A computer program of this model was employed to examine the sensitivity of unit gas cost to varying operating and design parameters. Designs were developed for sequential biological shift conversion reactors followed by biological methanation reactors, and for reactors in which both biological reactions occur simultaneously. DOE

N81-31395# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
COMPUTER PROGRAM FOR STORAGE AND RETRIEVAL OF THERMAL-STABILITY DATA FOR EXPLOSIVES
Robert W. Ashcraft Jun. 1981 19 p
(Contract DE-AC04-76DP-00487)
(MHSMP-81-29) Avail: NTIS HC A02/MF A01

A computer program for storage and retrieval of thermal stability data was written in HP Basic for the HP-9845 system. The data library is stored on a 9885 flexible disk. A program listing and sample outputs are included as appendices. DOE

N81-31396# Union Carbide Corp., Tarrytown, N.Y.
COTHANE, METHANE FROM WASTE CO Final Technical Report
J. A. Rabo, A. C Frost, L. F. Elek, A. P. Risch, and C. L. Yang Dec. 1980 117 p refs
(Contract DE-AC03-78CS-40177)
(DOE/CS-40177/T2) Avail: NTIS HC A06/MF A01

As the result of early efforts in the fields of catalysis, coal gasification, and methanation, Union Carbide developed a process for the direct concentration and conversion of CO in dilute waste streams to high quality methane (SNG). This two bed, two step process was dubbed COthane, a contraction of the feed carbon monoxide (CO) and the product methane. The objectives of this contract were to develop the COthane process up to the large pilot plant stage, to develop an improved catalyst, and to estimate the cost of methane produced by this process. The process development studies yielded all of the design parameters required to design a large scale pilot plant, the catalyst development program produced a catalyst with promising stability, and the economic studies showed that methane production cost would generally be more than $6/MM Btu. Because this cost is above those for natural gas, further work on this project was suspended until risng natural gas prices catch up with the more slowly rising COthane production cost. DOE

N81-31397# New Hampshire Univ., Durham.
ALTERNATE FUELS MANUFACTURED FROM HIGH TEMPERATURE SOLAR THERMAL SYSTEMS Technical Annual Progress Report, 1 Apr. 1980 - 31 Mar. 1981
1981 15 p refs
(Contract DE-AC02-79ET-21067)
(DOE/ET-21067/2) Avail: NTIS HC A02/MF A01

A feasibility study of three modes of transportation of coal and lignite is discussed. These modes are railroads, barges and slurry pipe lines. Geographical aspects and estimated costs of transporting coal are considered. The size and capacity of solar gasification plants are discussed, and locations are considered. Economic feasibility assessments for hybrid and direct solar units with respect to export potential are discussed. A bench scale fluidized-bed coal gasification unit is described, and its heat and material balances are tabulated. DOE

N81-31398# Rolls-Royce Ltd., Derby (England).
A UNITED KINGDOM VIEW ON FUTURE FUELS
A. B. Wassell 1981 7 p refs
(PNR-90068) Avail: NTIS HC A02/MF A01

It is noted that the quality of aviation fuel is expected to deteriorate as the available liquid hydrocarbon fuels become increasingly scarce. The characteristics of the fuel which are the most important from engine operational considerations are discussed. A reduction in the fuel thermal stability is likely to be the most serious problem both for fuel control and distribution systems. The aromatic content increase will require a complete design reoptimization to avoid visibility of the exhaust plume. Higher nitrogen oxide emissions will require more complex combustion systems. The increasing carbon production will lead to shorter combustor life. Exhaust visibility problems experienced between startup and ground idle are also discussed. It is shown that no single parameter will be sufficient to define fuel quality, and that design philosophies will probably be required.
Author (ESA)

N81-31399# New York State Dept. of Health, Albany. Div. of Labs. and Research.
METHANE PRODUCTION RATE STUDIES AND GAS FLOW MODELING FOR THE FRESH KILLS LANDFILLS Interim Report
C. O. Kunz and A. H. Lu Nov. 1980 83 p refs
(PB81-196552; NYERDA-80-21) Avail: NTIS HC A05/MF A01 CSCL 21D

Gas flow models were developed based on measurements

of the pressure differential between landfill gas and atmospheric pressure that would enable the rate of gas production to be estimated. Two landfill gas flow models were developed; a static model and a dynamic model. GRA

N81-31400# Northrop Services, Inc., Research Triangle Park, N. C.
IMPACT OF GASOHOL ON AUTOMOBILE EVAPORATIVE AND TAILPIPE EMISSIONS
John M. Lang and Frank M. Black Apr. 1981 14 p refs Presented at the Intern. Congr. and Exposition, Detroit, 23-27 Feb., 1981
(Contract EPA-68-02-2566)
(PB81-199952; EPA-600/J-81-137) Avail: NTIS HC A02/MF A01 CSCL 21D

National interest growing in the use of gasohol, a blend of ethanol and unleaded gasoline, as an alternate fuel to gasoline, is discussed. In order to assess its viability as a transportation fuel, gasohol's impact on vehicle emissions, fuel economy, and driveability are considered, along with the cost of production and the physical compatibility of ethanol with gasoline. GRA

N81-31401# Bureau of Mines, Pittsburgh, Pa. Research Center.
DIRECT METHOD DETERMINATION OF THE GAS CONTENT OF COAL: PROCEDURES AND RESULTS
W. P. Diamond and J. R. Levine Mar. 1981 42 p refs
(PB81-196735; BM-RI-8515; BMRI-1981) Avail: NTIS HC A03/MF A01 CSCL 08I

The explosion hazard of methane-air mixtures has become an increasingly serious mine planning problem and an advance assessment of methane gas potential can therefore be essential for a safe and economic mine development program. As part of its coal mine health and safety program. The Bureau of Mines has developed a simple, inexpensive test to measure the methane content of coal samples obtained from exploration cores. The gas content of coal per unit weight as determined by the direct method test can be used as a basis for a preliminary estimate of mine ventilation requirements, and to determine if degasification of the coalbed in advance of mining should be considered. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N81-31402*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN INVESTIGATION OF ASSEMBLY AND PERFORMANCE OF A RESISTOFLEX DYNATUBE 1/4 INCH FITTING
J. H. Ehl Jun. 1981 28 p refs
(NASA-TM-82429) Avail: NTIS HC A03/MF A01 CSCL 13K

Installation of titanium (6Al-4V) threaded fittings on 1/4 in. tubing is sensitive to workmanship and to the state of repair of the installation tooling. Tooling with very slight out-of-specification imperfections produces less than optimum swaged fittings. A significant quantity of samples were fabricated and X-rays were used to determine the depth of swage. Joint performance was assessed through static and dynamic testing. A.R.H.

N81-31403# Committee on Science and Technology (U. S. House).
INDUSTRIAL INNOVATION
Washington GPO 1980 147 p refs Hearing before the Subcomm. on Sci., Res., and Technol. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 159, 21 Jul. 1980
(GPO-70-074) Avail: NTIS Avail: Subcommittee on Science, Research, and Technology

The effects of fiscal and regulatory policies on reindustrialization are highlighted. The Federal patent policy, technology transfer, high technology small business innovation, and problems such as the drug lag problem and technology trade with other countries are discussed. T.M.

N81-31404# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PERFORMANCE ANALYSIS OF DEDICATED HEAT-PUMP WATER HEATERS IN AN OFFICE BUILDING
L. Morrison May 1981 13 p refs Presented at the 3rd Conf. on Waste Heat Management and Utilization, Miami, Fla., 11-13 May 1981
(Contracts DE-AC02-77CH-0017; EG-77-C-01-4042)
(SERI/TP-721-1198; CONF-810545-4) Avail: NTIS HC A02/MF A01

The performance of two generic dedicated heat pump water heaters (HPWHs) in supplying the domestic hot water (DHW) needs of a medium sized office building were evaluated. Data measurements and assumptions were made to compensate for a faulty flow meter. A stand alone heat pump plumbed to a conventional tank obtains a coefficient of performance (COP) of 2.4 but only delivers load water temperatures of about 41 C. An integral heat pump/tank unit was tested. Recirculating loop losses account for 75% of the energy delivered by the JPWHs. It is suggested that these losses be reduced by 75% if the recirculating loop were insulated. DOE

N81-31405# Portland Cement Association, Skokie, Ill. Construction Technology Labs.
LONG-TERM CREEP OF HANFORD CONCRETE AT 250 DEG F AND 350 DEG F Final Report
Michael Gillen Richland, Wash. Rockwell International Corp. Oct. 1980 22 p refs
(Contract DE-AC06-77RL-01030)
(RHO-C-50) Avail: NTIS HC A02/MF A01

Test results described cover the creep behavior of Hanford concretes at elevated temperatures. Two each of 6 by 12 in. concrete cylinders were subjected to static compressive loads of 500 psi at 350 F and 1500 psi at 250 F and 350 F. Test cylinders were cast with materials and mix designs similar to those used in Hanford concrete structures. Effects of load and temperature on deformation of Hanford concrete are discussed. Increased static load reduced the amount of thermal strain when cylinders were heated above ambient. At 350 F, the magnitude of creep strain of cylinders increased with increased static load. At a test load of 1500 psi, magnitude of creep strain increased with increased temperature. Creep data were satisfactorily modeled with an expression of the form creep strain = A log10 (t) + B, where creep strain is in millionths, and t is time at test temperature, in days. Values for the coefficient, A, varied from 255.6 to 286.9. Magnitude of the constant B, ranged from 182.1 to 718.6. DOE

N81-31406# Ampec Corp., Arlington, Mass.
RESEARCH ON THE OPTIMIZATION OF VISCOUS FLUID MIXING
Ogden H. Hammond, Wayne Powell, and Antonios Prentakis 1980 207 p refs
(Grant NSF DAR-79-17713)
(PB81-176216; NSF/RA-800417) Avail: NTIS HC A10/MF A01 CSCL 13H

Primary objectives of this project are: (1) to gain a better undertanding of mixing and; (2) to develop a practical method for epoxy encapsulation of electronics. Development of design criteria for a new type of mixer is reported. Such a mixer produces an irreversibly mixed output in contrast to conventional mixers which produce outputs that may be unmixed. The report describes calibration and flow visualization experiments in which various mixing methods are evaluated and another experimental verifying the mixing concept. Fluids used in the experiments are glycerine and a low cost potting epoxy. A method for estimating the diffusion coefficient of reactive systems is incuded. Results obtained generally confirm the mathematically analysis presented. GRA

N81-31407# Louisiana Dept. of Transportation and Development, Baton Rouge. Research and Development Section.
ASPHALTIC CONCRETE OVERLAYS OF RIGID AND FLEXIBLE PAVEMENTS Final Report, Oct. 1970 - Oct. 1980
Richard W. Kinchen and William H. Temple Oct. 1980 93 p refs
(PB81-197394; FHWA/LA-80/147) Avail: NTIS

HC A05/MF A01 CSCL 13B

The development of a mechanistic approach to overlay thickness selection is described. The procedure utilizes a deflection analysis to determine pavement rehabilitation needs. Design guides for selecting the overlay thickness are presented. Tolerable deflection-traffic load relationships and the deflection attenuation properties of asphaltic concrete were developed, representing the subgrade support conditions and properties of materials used in Louisiana. All deflection measurements on asphaltic concrete were corrected for the effect of temperature. Deflection measurements taken before and after overlay were also adjusted to minimize the effects of seasonal subgrade moisture variation. GRA

N81-31408# Purdue Univ., Lafayette, Ind. Joint Highway Research Project.

THE PREDICTION OF THE FREEZE/THAW DURABILITY OF COARSE AGGREGATE IN CONCRETE BY MERCURY INTRUSION POROSIMETRY Interim Report

Meredith Nickels Lindgren 1 Oct. 1980 96 p refs Prepared in cooperation with Federal Highway Administration and Indiana State Highway Administration, Indianapolis

(PB81-200073; JHRP-80-14; FHWA/IN/JHRP-80/14) Avail: NTIS HC A05/MF A01 CSCL 13B

Aggregates from fifty-two Indiana highway cores were tested as were five rock samples supplied by the Portland Cement Association. The Expected Durability Factor values were determined from the pore size distributions, and an average value was assigned to each pavement associated with the cores. These values were then compared with the field performance of the pavement to ascertain the borderline between EDF values for durable and for nondurable aggregates. A good correlation between the field performance and the average EDF values was found. A pavement will be durable if its coarse aggregate has an EDF value greater than 50 for 90% or more of the aggregate. This criterion applies to stone and gravel aggregates with a maximum size of 1-1/2 to 2-1/2 inches. The pavement will be durable for at lest thirty years. GRA

N81-31409# Texas Univ. at Arlington. Center for Transportation Research.

SUMMARY AND RECOMMENDATIONS FOR THE IMPLEMENTATION OF RIGID PAVEMENT DESIGN, CONSTRUCTION AND REHABILITATION TECHNIQUES Final Report

B. F. McCullough, W. R. Hudson, and C. S. Noble Mar. 1981 165 p refs Prepared in cooperation with Federal Highway Administration, Austin, Tex.

(PB81-200578; CTR-3-8-75-177-22F; FHWA/TX-81/2-177-22F) Avail: NTIS HC A01/MF A01 CSCL 13B

In order to explain observations of significantly different performances for many of the rigid pavements in Texas, a quantitative evaluation was required to relate distress mechanisms to distress manifestation and to develop better predictions of performance. The CTR staff had previously derived underlying principles concerning the mechanistic behavior of composite materials. Maintenance and rehabilitation studies were performed concurrently using information collected from condition survey and surface profile measurements. This information was analyzed in depth in the development of distress prediction models and suitable criteria for use in rehabilitation decision making. The implementation of several innovative rehabilitation techniques is also described. GRA

N81-31410# California Univ., Berkeley. Electrical Engineering and Computer Sciences.

INTERACTIVE OPTIMAL DESIGN OF DYNAMICALLY LOADED STRUCTURES

M. A. Bhatti, K. S. Pister, and E. Polak 1980 22 p refs Presented at the Am. Soc. of Civil Engrs. Conv. and Exposition, Hollywood, Fla. 27-31 Oct. 1980

(Contract F49620-79-C-0178; Grants NSF ENV 76-04264; NSF ECS-79-13148; NSF PFR-79-08261; NSF ENG-78-10442)

(PB81-195679; Preprint-80-635; NSF/RA-800474) Avail: NTIS HC A02/MF A01 CSCL 13M

An interactive software system for optimal design of civil engineering structures is described. Operating on a DEC VAX 11/780 computer, the system is a virtual memory version of UNIX (a Bell Labs System). The design algorithm is described and its interactive implementation discussed. As an example, optimal design of a nonlinear single degree of freedom impact absorber is presented. The system permits one to stop, restart, or modify any of the design parameters as the computation progresses, resulting in substantial savings in computing time. By using computer graphics, it helps to familiarize practicing engineers with optimization techniques. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N81-31411 British Broadcasting Corp., Kingswood (England).

SATELLITE BROADCASTING: AN EXPERIMENTAL TRANSMISSION OF TELEVISION WITH DIGITAL STEREOPHONIC SOUND

J. L. Eaton and R. V. Harvey Apr. 1981 10 p refs

(BBC-RD-1981/3) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Satellite broadcasting tests of television with two sound channels digitally modulated onto a subcarrier were carried out through the European Orbital Test Satellite (OTS). The parameters of the sound system (subcarrier amplitude and frequency) were varied during the experiments and error rates were measured in the sound channels. The tests confirmed the feasibility of the method for satellite broadcasting in the future. Author

N81-31412 Utah State Univ., Logan.

AN INVESTIGATION OF A DIFFERENTIAL-INTEGRAL METHOD FOR CALCULATING ELECTROMAGNETIC SCATTERING BY INHOMOGENEOUS OBJECTS Ph.D. Thesis

Chun-Hong Harry Chen 1981 191 p

Avail: Univ. Microfilms Order No. 8116783

A hybrid differential-integral method was developed for calculating the electromagnetic scattering characteristics of inhomogeneous objects. The new hybrid technique has the potential of permitting fine-scale modeling of inhomogeneities in an object while at the same time providing for the accurate computation of the scattering characteristics at minimum cost. The hybrid method utilizes the finite method within a closed surface circumscribing the inhomogeneous scatterer to generate coupled sets of basis functions, in terms of which the equivalent surface currents can be expanded with unknown coefficients. This procedure involves a numerical solution for the couple azimuthal potentials. The extended boundary condition method is then employed to determine the unknown coefficients and yield the scattering results. The hybrid method so developed is called the extended boundary condition-finite method.

Dissert. Abstr.

N81-31413 Michigan Univ., Ann Arbor.

ELECTROMAGNETIC FIELDS RESULTING FROM SIMPLE ACCELERATION Ph.D. Thesis

Sammie Giles, Jr. 1981 108 p

Avail: Univ. Microfilms Order No. 8116240

A study of electromagnetism in a certain class of accelerating systems is presented. This class of systems is characterized by the transformation of only one of the spatial coordinates, and flatness of the four space. A theoretical basis is formulated and applied to three problems: (1) observation of a stationary point charge from an accelerating system; (2) observation from an accelerating system of the scattered field of an incident plane wave on a small, perfectly conducting sphere; and (3) observation from an inertial system of the scattered fields of an incident plane wave on a small, perfectly conducting, accelerating sphere. Dissert. Abstr.

N81-31414 Michigan State Univ., East Lansing.

INTEGRAL-OPERATOR ANALYSIS OF OPEN-BOUNDARY DIELECTRIC WAVEGUIDES Ph.D. Thesis

Dean Richard Johnson 1981 18 p
Avail: Univ. Microfilms Order No. 8117244

An integral-operator technique is described as an alternative method to conventional boundary-eigenvalue analysis for electromagnetic (EM) wave propagation in relatively-general, open-boundary dielectric (millimeter-wave or optical) waveguides. A polarization current is exploited to establish a electric-field integral equation (EFIE) describing the EM field in the heterogeneous core of an open-boundary waveguide. Analytical solutions of EFIEs are described to recover the well-known transverse field dependence and propagation characteristics of surface-wave and radiation modes supported by relatively-simple dielectric waveguide structures. Numerical solution of EFIEs describing surface-wave modes (field plots and dispersion characteristics) supported by planar, graded-index, dielectric-slab and step-index, rectangular dielectric waveguides are represented. An EFIE formulation for excitation of discrete, guided, surface-wave modes and continuous-spectrum radiation modes along open-boundary waveguides is introduced. Dissert. Abstr.

N81-31415 Wisconsin Univ. - Madison.
REFLECTION, TRANSMISSION AND RADIATION OF AN EM SURFACE WAVE INCIDENT ON A TRANSITION OF SURFACE REACTANCE Ph.D. Thesis
Kwang Soo Park 1980 134 p
Avail: Univ. Microfilms Order No. 8111475

Mathematical and numerical procedures for the two dimensional scattering problem of a trapped TM surface wave propagating along a plane surface having a nonuniform surface impedance transition are developed. The problem is formulated using the compensation theorem and a modification of the original problem yielding a Fredholm integral equation of the second kind, which is then solved. The magnetic field on the surface is found first, including the complex reflection and transmission coefficients. These are crucial in understanding the scattering process. Then the radiation pattern is obtained. The accuracy of the numerical solution is confirmed by comparing the results with previous analytic solutions for the abrupt transition. Dissert. Abstr.

N81-31416 Ohio State Univ., Columbus.
MOMENT METHOD SOLUTIONS FOR RADIATION AND SCATTERING FROM ARBITRARILY SHAPED SURFACES Ph.D. Thesis
Pravit Tulyathan 1981 107 p
Avail: Univ. Microfilms Order No. 8115163

General quadrilateral surface-patch, thin-wire, and wire/plate attachment modes are developed for the moment method solution of electromagnetic scattering and antenna problems. The basic theory along with the techniques for accurate and efficient evaluation of the impedance elements are described. The methods to automatically set up the surface patch modes for a polygonal plate are given. Numerical results for various antennas and scatterers are compared with other theoretical results and measurements. Using techniques developed, the microstrip antenna is analyzed and the numerical results are also presented. Dissert. Abstr.

N81-31417 Rice Univ., Houston, Tex.
PACKET COMMUNICATION IN DELTA AND RELATED NETWORKS Ph.D. Thesis
Daniel Manuel Dias 1981 257 p
Avail: Univ. Microfilms Order No. 8116954

Delta networks are a class of multistage interconnection networks that can be used to interconnect a large number of modules in a modular computing system. In a packet communication environment, the modules in a system communicate asynchronously using fixed size packets. In this environment, delta networks exhibit a large parallelism in packet transfer leading to good performance. They also allow for local control in packet routing, extensibility, and simple proofs of correctness.
Dissert. Abstr.

N81-31418*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MLS ANTENNA LOCATIONS FOR THE DEHAVILAND DASH 7 AIRCRAFT
Melvin C. Gilreath, Henry S. Earl, Jr., and Berkeley A. Langford, Jr. Jul. 1981 46 p refs
(NASA-TM-83195) Avail: NTIS HC A03/MF A01 CSCL 17B

Several proposed aircraft antenna locations were investigated to determine their potential for satisfying the microwave landing system antenna coverage requirements. The results of this investigation are presented and antenna locations are recommended for the deHavilland DASH 7 aircraft. R.C.T.

N81-31419*# General Electric Co., Philadelphia, Pa. Space Systems Div.
THE 30/20 GHz DEMONSTRATION SYSTEM SSUS-D/BSE Final Report, Dec. 1980 - Jul. 1981
Jul. 1981 543 p
(Contract NAS3-22500)
(NASA-CR-165454) Avail: NTIS HC A23/MF A01 CSCL 17B

The systems consisting of a 30/20 GHz communication satellite featuring a multiple fixed beam and scanning beam antenna, SS-TDMA, onboard processing and high power TWT's and IMPATT amplifiers, a trunking space-diversity Earth station, a customer premise system (CPS) portable Earth station and a Master Control Station. Hardware, software and personnel are included to build and launch one satellite and to carry on a two year experimentation and demonstration period of advanced Ka-band systems concepts and technology. Included are first level plans identifying all tasks, a schedule for system development and an assessment of critical technology and risk and a preliminary experiments plan. T.M.

N81-31420# Committee on House Administration (U. S. House).
TECHNICAL ADVISORY PANEL ON THE DIGITAL DATA COMMUNICATIONS NETWORK
Washington GPO 1981 167 p Hearings before the Policy Group on Inform. and Computers of the Comm. on House Admin., 97th Congr., 1st Sess., 28-29 Jan. 1981
(GPO-75-433) Avail: Policy Group on Information and Computers

The network is being developed to meet the future communications needs of the U.S. House of Representatives. Background information on the efforts to date and the essential elements and characteristics of the network is provided. T.M.

N81-31421*# Texas Univ. at Arlington. Applied Research Labs.
DEVELOPMENT OF A GROUND SIGNAL PROCESSOR FOR DIGITAL SYNTHETIC ARRAY RADAR DATA Final Report, 1 Jul. 1980 - 31 Mar. 1981
Carroll R. Griffin and James M. Estes 22 May 1981 57 p refs
(Contract NAS9-16104)
(NASA-CR-161074; ARL-TR-81-21) Avail: NTIS HC A04/MF A01 CSCL 17I

A modified APQ-102 sidelooking array radar (SLAR) in a B-57 aircraft test bed is used, with other optical and infrared sensors, in remote sensing of Earth surface features for various users at NASA Johnson Space Center. The video from the radar is normally recorded on photographic film and subsequently processed photographically into high resolution radar images. Using a high speed sampling (digitizing) system, the two receiver channels of cross-and co-polarized video are recorded on wideband magnetic tape along with radar and platform parameters. These data are subsequently reformatted and processed into digital synthetic aperture radar images with the image data available on magnetic tape for subsequent analysis by investigators. The system design and results obtained are described. Author

N81-31422# Committee on Science and Technology (U. S. House).
COMMUNICATIONS RESEARCH AND DEVELOPMENT
Washington GPO 1980 485 p refs Hearings before the Subcomm. on Transportation, Aviation, and Commun. and the Subcomm. on Sci., Res., and Technol. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 130, 20-22 and 28 May 1980
(GPO-66-114) Avail: Subcommittee on Transportation, Aviation, and Communications

Legislation in the area of communications research and

development is discussed. Current Federal policies were reviewed with special emphasis on the rapid convergence of telecommunications and information technologies. T.M.

N81-31423*# Ross (S.) and Co., Boston, Mass.
NASA ELECTRONIC MESSAGE EXPERIMENT AND STUDY: DETAILED TEST PLANS
1 Nov. 1979 29 p Prepared for RCA Corporation, Camden, N.J.
(Contract NAS5-25648)
(NASA-CR-160007) HC A03/MF A01 CSCL 17B

A methodology for evaluating the utility of high speed digital facsimile as a component of the projected NASA-wide electronic message network is presented. Equipment checkout, operator familiarization, pretest calibration, and the development of procedures are addressed. An experimental test program of the facsimile message service which will carry duplicates of the actual messages sent by other means is highlighted. Also, an operational test program during which messages will be sent on a regular basis in order to accumulate the information that will be used to evaluate system performance and project future growth is described. J.M.S.

N81-31424# Mitre Corp., Bedford, Mass.
DESIGN AND IMPLEMENTATION OF PROJECT 7140 WIDEBAND HF COMMUNICATION TEST FACILITY
B. D. Perry Hanscom AFB, Mass. Electronic Systems Div. Jul. 1981 93 p refs
(Contract F19628-80-C-0001; AF Proj. 7140)
(AD-A102261; MTR-8174; ESD-TR-81-135) Avail: NTIS HC A05/MF A01 CSCL 20/14

The primary objective of project 7140 is to prove the feasibility of the concept of HF communications using signals having bandwidths on the order of one megahertz through a series of experiments employing a flexible test facility designed and built for this purpose. The test facility includes a transmitter, equalized receiver, and interference measurement and other support equipments. This report concentrates on the design and realization of the test facility. Descriptions of the wideband HF channel and the planned experimental program are also included. Author (GRA)

N81-31425# Mitre Corp., Bedford, Mass.
FIBER OPTIC TRANSCEIVER DESIGN Interim Report
G. L. Tenuta Griffiss AFB, N.Y. RADC Jun. 1981 20 p ref
(Contract F19628-81-C-0001; AF Proj. 4519)
(AD-A102362; RADC-TR-81-112) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report covers the electronic circuits and components needed to implement high performance optical communications systems including: a self-compensated laser transmitter; and LED transmitter with avalanche capability; a high impedance bipolar preamplifier; a digital receiver with AGC and DC restoration and an all-in-one fixed gain, limiting receiver. GRA

N81-31426# Naval Postgraduate School, Monterey, Calif. Dept. of Systems Technology.
INVESTIGATION OF PARAMETERS AFFECTING VOICE RECOGNITION SYSTEMS IN C3 SYSTEMS M.S. Thesis
Mary Pamela Batchellor Mar. 1981 80 p refs
(AD-A102371) Avail: NTIS HC A05/MF A01 CSCL 17/2

This research investigates the use of a voice recognition system by military operators officer, enlisted, male and female. The application intended is the use of a discrete utterance voice recognition system in a command center environment. The system would be used by members of a watch team to execute ad hoc queries against an automated data base in support of their command center duties. The following factors were examined: the adaptability of a random sample of active duty military personnel to a voice input system; the accuracy of such a system; the effects of male versus female operators; and the effects of officer versus enlisted operators -- the advantages/disadvantages of using three, five or ten trained passes to train the voice system. Results showed no significant difference in error rates between the categories of officer and enlisted nor between male and female. Three training passes had a slightly higher error rate than five or ten passes but five and ten passes were the same. Author (GRA)

N81-31427# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
A LONGITUDINAL STUDY OF COMPUTER VOICE RECOGNITION PERFORMANCE AND VOCABULARY SIZE
Gary K. Poock Jun. 1981 39 p refs
(AD-A102208; NPS55-81-013) Avail: NTIS HC A03/MF A01 CSCL 09/2

This research examined voice recognition performance as a function of time and showed no decrement in performance after 21 weeks. In addition, vocabulary sizes up to 240 utterances showed stable performance. Two people also combined their voice reference patterns and were then able to achieve an error rate of less than 2% when either person spoke to the speaker-dependent voice recognition unit. Author (GRA)

N81-31428# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
DETECTION OF MOVING TARGETS BY ADAPTIVE CLUTTER SUPPRESSION Final Report, Oct. 1978 - Jun. 1981
A. Papoulis Jun. 1981 62 p refs
(Contract N00014-76-C-0144; ARPA Order 2684)
(AD-A102273; POLY-EE/CS-81-002) Avail: NTIS HC A04/MF A01 CSCL 17/9

An adaptive filtering method is developed for detecting a moving target in the presence of strong interference. The motion of the target is utilized to create a high frequency component in the observed signal. The filtering is performed in terms of the running transform of the data and the local statistics of the interference. Other problems considered include spectral estimation and image restoration by extrapolation. Author (GRA)

N81-31429# Ohio State Univ., Columbus. ElectroScience Lab.
A HYBRID UTD-EIGENFUNCTION METHOD FOR SCATTERING BY A VERTEX Interim Report
J. N. Sahalos and G. A. Thiele May 1981 65 p refs
(Contract F19628-78-C-0198; AF Proj. 2305)
(AD-A102137; ESL-711353-3; RADC-TR-81-89) Avail: NTIS HC A04/MF A01 CSCL 20/3

Present solution for the electromagnetic scattering by a vertex are either approximate or difficult to use for computations. For example, GTD solutions for vertex scattering are not yet fully developed and yield approximate results of unknown accuracy. The exact eigenfunction solution is both difficult to use and computationally inefficient due to the large number of eigenfunctions that must be retained. In this work, we obtain the scattering by a vertex (e.g., a quarter plane) by employing the exact eigenfunction solution only in a very small region close to the tip of the vertex (i.e., within 0.2 lambda). Thus, only a small number of eigenfunctions (e.g., two or three) are required to obtain the current in the top region. Outside of this region, the UTD is employed to obtain the current. The changeover point is determined by finding the point where the eigenfunction current has decayed to that predicted by UTD wedge diffraction theory. Results will be shown for both the current on the quarter plane and also for the scattered field. In addition, the field scattered by a rectangular plate using this method will be compared with that predicted by the UTD with vertex diffraction, and the results will be seen to be in very close agreement. Author (GRA)

N81-31430# Ohio State Univ., Columbus.
THE EFFECT OF A PULSED INTERFERENCE SIGNAL ON AN ADAPTIVE ARRAY
R. T. Compton, Jr. Apr. 1981 43 p refs
(AD-A102258; ESL-712684-8; TR-712684-8) Avail: NTIS HC A03/MF A01 CSCL 20/14

This report examines the performance of an LMS adaptive array in the presence of a pulsed interference signal. It is shown that a pulsed interference signal has two effects. First, it causes the array to modulate the desired signal envelope (but not its phase). Second, it causes the array output signal-to-interference-plus-noise ratio (SINR) to vary with time. The desired signal modulation is evaluated as a function of signal arrival angles, powers and interference PRF and pulse width. It is shown that the signal modulation is small except when the interference arrives close to the desired signal. To evaluate the effect of the time-varying SINR, it is assumed that the array is used in a DPSK communication system. It is shown that the SINR variation

causes a noticeable but not disastrous increase in the bit error probability. Author (GRA)

N81-31431# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

HF/UHF LOW-LOSS NANOSECOND VARIABLE DELAY LINES Phase Report, 1 Oct. 1979 - 30 Dec. 1980

Donald E. Clark and William R. Hardell Jun. 1981 62 p refs
(Contract F30602-78-C-0120; AF Proj. 2338)
(AD-A102271; GIT-EES-A-25225(F); RADC-TR-81-109) Avail: NTIS HC A04/MF A01 CSCL 09/1

Two delay line techniques are described: one for the HF band and the other for the UHF band. Both lines are similar in that they are broadband, low-loss, low-impedance, and nanosecond variable. The HF delay line is electrically variable and utilizes ceramic dielectric and ferrite materials in a coaxial line configuration. The UHF delay line is mechanically variable and utilizes coupled helical transmission lines. The design principles for the two delay lines are discussed and the construction details are described. Characteristics of both lines are measured and data presented in graphical form. Author (GRA)

N81-31432# Illinois Univ. at Urbana-Champaign. Electromagnetics Lab.

STUDY OF ANTENNA RADOME PROBLEMS Final Technical Report, 6 Apr. 1980 - 5 Apr. 1981

S. W. Lee, M. S. Sheshadri, and R. Mittra Apr. 1981 129 p refs
(Contract N00019-80-C-0284)
(AD-A102205; UIEM-81-4; UILU-ENG-81-2545) Avail: NTIS HC A07/MF A01 CSCL 17/9

In a previous report, details of the analysis of a curved dielectric radome using geometrical optics were considered for a point source. In this report, we first consider the transmission of a spherical or plane wave through a curved dielectric interface. The transmitted field is proportional to the product of the conventional Fresnel's transmission coefficient and a divergence factor DF, which describes the cross-sectional variation (convergence or divergence) of a ray pencil as the latter propagates in the transmitted region. The factor DF depends on the incident wavefront, the curvatures of the interface, and the relative indices of the two media. We give explicit matrix formulas for calculating DF, illustrate its physical significance via examples, and point out an erroneous solution in the recent literature. GRA

N81-31433# Lincoln Lab., Mass. Inst. of Tech., Lexington.

FINITE-SUM EXPRESSIONS FOR SIGNAL DETECTION PROBABILITIES

Edward J. Kelly 20 May 1981 95 p refs
(Contract F19628-80-C-0002)
(AD-A102143; TR-566; ESD-TR-81-93) Avail: NTIS HC A05/MF A01 CSCL 12/1

A unified approach is applied to the derivation of a number of formulas for the probability of signal detection and the probability of false alarm. The context is incoherent integration, with fluctuating signal-to-noise ratios and/or fluctuating thresholds. The standard results are obtained and extended to more general fluctuation models. A fundamental duality is established between fluctuating signals and fluctuating thresholds and used to simplify the derivations. Also included is an expression of the cumulative F-distribution as a finite sum of Marcum Q-functions. Author (GRA)

N81-31434# Weapons Systems Research Lab., Adelaide (Australia).

THE EQUIVALENCE OF LINEARLY CONSTRAINED OPTIMUM ARRAY WEIGHT VECTORS UNDER DIFFERENT OPTIMIZATION CRITERIA

D. A. Gray Sep. 1980 27 p refs
(AD-A102323; WSRL-0178-TR) Avail: NTIS HC A03/MF A01 CSCL 09/3

The performance of arrays of receivers can be improved by optimization of the weighting vectors used to form the output beams. Three optimization criteria are considered: minimization of total output power, least mean square fit to a signal vector, and maximization of signal-to-noise ratio. For practical purposes it is often necessary to apply some form of constraint to the weighting vectors. The optimum narrowband array weight vector is derived for each of the three criteria when an arbitrary set of linear constraints are imposed on the weight vector. The equality of the derived weight vectors in most cases of practical interest is proved. Finally, some examples are considered which show how a number of recently proposed weighting vectors can be derived as special cases of the constrained solutions. Author (GRA)

N81-31435# Weapons Systems Research Lab., Adelaide (Australia).

OPTIMUM BEAMFORMING SUBJECT TO MULTIPLE LINEAR CONSTRAINTS

A. K. Steele Sep. 1980 31 p refs
(AD-A102322; WSRL-0182-TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

Optimum beamformers with a single look direction constraint can suffer from signal suppression problems when the optimum weights are calculated from the inverse of the signal-plus-noise cross-spectral matrix. Signal suppression occurs when the beam steer direction does not exactly correspond to the signal direction and this can occur if the number of fixed beams is small. The use of multiple linear constraints upon the optimum weights reduces this signal suppression. Multiple directional constraints can lead to ill-conditioned equations. However, it is shown that the limiting solutions of multiple directional constraints are multiple derivative contraints and these do not lead to ill-conditioned equations. The ability of various derivative constraints to prevent signal suppression is analyzed quantitatively. Author (GRA)

N81-31436# SRI International Corp., Menlo Park, Calif. Bioengineering Research Center.

PERCEPTION OF SPATIAL FEATURES WITH STEREOSCOPIC DISPLAYS Summary Progress Report, 1 Sep. 1979 - 31 Aug. 1980

Thomas P. Piantanida 24 Oct. 1980 24 p refs
(Contract N00014-79-C-0742; SRI Proj. 8899)
(AD-A102156) Avail: NTIS HC A02/MF A01 CSCL 14/5

At the beginning of this project year, our plan was to review the literature pertaining to stereo display systems, binocular vision and stereopsis, and the interaction of the observer with the display system in order to determine which major display system variables warranted closest and most immediate study. Upon delving into the literature, we found that, very often, no distinction is made between systems that require stereopsis and those that do not. Consequently, it is first necessary to categorize existing displays into those that require the viewer to observe the display with both eyes and those that transmit the same information to the observer even when viewed monocularly. GRA

N81-31437# Washington Univ., Seattle. Dept. of Electrical Engineering.

MODELING AND PERFORMANCE OPTIMIZATION OF LARGE-SCALE DATA-COMMUNICATION NETWORKS Ph.D. Thesis

Francis D. Gorecki Jun. 1981 158 p refs
(Grants AF-AFOSR-3546-78; NSF ECS-80-11262)
(AD-A102341; UW-EE-TR-221; AFOSR-81-0206TR) Avail: NTIS HC A08/MF A01 CSCL 12/1

A new theory of modeling, analysis, and performance optimization is developed and illustrated for large-scale, data-communication networks. In a novel and significant departure from existing problem formulations, channel and network models are presented which include the effects of channel distortion, nodal processing errors, and protocol dependent errors. All of these effects are of critical importance in practice, but cannot be readily incorporated into other models. Information theoretic techniques are developed, and used to characterize network capacity and message integrity as a function of protocols, routing policies, channel capacity assignment, and channel distortion. Flow assignment techniques which optimize network performance with respect to certain classes of physically important performance metrics are formulated and employed to derive new centralized and distributed routing algorithms. Author (GRA)

N81-31438# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.

AN ALGEBRAIC APPROACH TO DATA-ADAPTIVE ARRAY

PROCESSING
Thomas P. Bronez and James A. Cadzow Apr. 1981 9 p refs Prepared in cooperation with Bell Telephone Lab., Whippany, N.J.
(Contract N00014-80-C-0303)
(AD-A101872; Rept-12) Avail: NTIS HC A02/MF A01 CSCL 09/3

In an earlier paper, an algebraic characterization was made of the problem of resolving closely spaced plane waves incident on a linear array. The characterization suggests several data-adaptive processing methods and encompasses the Wiener, Maximum Likelihood, and Pisarenko methods. In this paper, the algebraic approach is amplified and the results extended to consider correlated noise. A recursive algorithm is given for a particularly effective processing method. Author (GRA)

N81-31439# Syracuse Univ., N. Y.
TIME-DOMAIN IN ANALYSIS OF LUMPED/DISTRIBUTED NETWORKS FOR ELECTROMAGNETIC COMPATIBILITY (EMC) APPLICATIONS Phase Report, Jun. 1979 - Aug. 1980
J. Lamar Allen Griffiss AFB, N.Y. RADC Jun. 1981 59 p refs Prepared in cooperation with South Florida Univ.
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A102268; RADC-TR-81-110) Avail: NTIS HC A04/MF A01 CSCL 09/5

A new technique suitable for time-domain analysis of a very general class of lumped/distributed networks is introduced. The basic procedure is described and illustrated with examples. The analysis procedure can also be used to generate time-domain models of transmission lines and other structures. This feature is illustrated by generating an exceptionally simple model for lossless transmission lines. Finally, a novel concept using time-varying reflection coefficients is introduced. Author (GRA)

N81-31440# Stanford Univ., Calif. Div. of Applied Mechanics.
PLANE-STRAIN SURFACE WAVES IN A LAMINATED COMPOSITE Interim Report
George Herrmann May 1981 38 p refs
(Contract N00014-76-C-0054)
(AD-A102087; SUDAM-81-2) Avail: NTIS HC A03/MF A01 CSCL 20/14

Elastic wave propagation in plane strain in a periodically layered half-space is considered, with the layering parallel to the bounding traction-free plane. Attention is focused on surface waves of the Rayleigh-type propagating parallel to the bounding plane. It is found that such waves are highly dispersive and that higher branches may be discontinuous. Author (GRA)

N81-31441# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
SCATTERING AND ABSORPTION OF ELECTROMAGNETIC WAVES BY SPHEROIDAL RAINDROPS
R. Valentin May 1979 17 p refs In GERMAN; ENGLISH summary
(Rept-455-TBr-67) Avail: NTIS HC A02/MF A01

The complex scattering coefficients for spheroidal raindrops were calculated at 18.8 and 28.8 GHz by using approximate methods. The directions of polarization are assumed to be parallel and perpendicular to the symmetry axes of the drop. The attenuation and phase rotation for horizontal and vertical polarization were determined from the measured rain intensity along a propagation path of 20 km. The theoretical results are compared with experimental values pertaining to different rain events. The phase shift proves to be very sensitive to the drop deformation. From these results and the simultaneously measured vertical gradient of the wind velocity, the probability distribution of the angle of the symmetry axis of the oblate raindrops towards the vertical is derived. Author (ESA)

N81-31442# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
SPACE DIVERSITY EXPERIMENTS ON A 20 KILOMETER LONG 15 GHz LINK
Hans-Georg Giloi Sep. 1980 30 p refs In GERMAN; ENGLISH summary
(Rept-455-TBr-70) Avail: NTIS HC A03/MF A01

Space diversity experiments, designed to reduce fading outages of radio links caused by multipath propagation, were performed by means of two vertically separated receiving antennas. The link ran parallel to a chain of raingauges and it was possible to eliminate rain events from the attenuation statistics. The statistical distribution of the fadings was computed for the cases of single reception, switching diversity and in-phase combining diversity. The improvement obtained is less than that predicted by theory for uncorrelated field strengths at the receiving antennas. Methods for distinguishing between multipath fading and rain attenuation when only daily meteorological reports are available were investigated and elimination criteria are indicated.
Author (ESA)

N81-31443# Royal Signals and Radar Establishment, Malvern (England).
REPORT ON THE MILITARY MICROWAVES' 1980 CONFERENCE
M. R. B. Dunsmore and S. E. Gibbs Feb. 1981 15 p refs Conf. held in London, 22-24 Oct. 1980
(RSRE-MEMO-3348; BR78416) Avail: NTIS HC A02/MF A01

Summaries of papers given at the conference are given. Millimeter waves, electronic warfare support measures, guided weapons and air defense radar were included. Solid state transmitters, microwave tubes, antenna arrays, polarization control, radomes and communications equipment were discussed. Low noise receivers, transmit-receive devices for radars, radar test equipment and radar instrumentation were included.
Author (ESA)

N81-31444# Royal Signals and Radar Establishment, Malvern (England).
THE COLLINEAR COAXIAL ARRAY ANTENNA
D. J. Brammer and D. Williams Mar. 1981 20 p refs
(RSRE-Memo-3350; BR78811) Avail: NTIS HC A02/MF A01

A design of a coaxial vertical antenna proposed in the ARRL antenna handbook is analyzed. A numerical analysis was carried out using the moment method. A variety of antenna configurations in the 160 MHz design frequency are analyzed and current distribution, gain, polar diagrams and impedances are calculated. The analysis is carried out for simple configurations and extended to a case with 16 repeated center sections. The effects of using lossy cable in the construction is also investigated. A defect in the original ARRL design is rectified. An array of an overall length 5.33 wavelengths is shown to have a gain of 10.69 dB.
Author (ESA)

N81-31445# Fondazione Ugo Bordoni, Rome (Italy).
PREDICTION OF RAIN INTENSITY SIMULTANEITY FOR THE OPTIMIZATION OF MULTIBEAM SATELLITE COMMUNICATION SYSTEMS [PREVISIONE CONTEMPORANEITA EVENTI DI PRECIPITAZIONE PER L'OTTIMIZZAZIONE GESTIONALE DI COLLEGAMENTI VIA SATELLLITE AD ACCESSO MULTIPLO]
Francesco Barbaliscia and Aldo Paraboni (Politecnico di Milan) Dec. 1980 24 p ref In ITALIAN
(FUB-49-1980) Avail: NTIS HC A02/MF A01

A method to compute the joint probability of rain intensity limits in two stations at a distance is presented. This correlation of rain intensities serves to calculate the out-of-service probability of pairs of microwave beams in a satellite communication system with receiving stations spaced less than 200 kilometers apart. A logarithmic regression coefficient is found in an analysis carried out over 16 Italian localities. The joint probability of exceeding simultaneously a given rain intensity limit is found by multiplying the distance dependent coefficient by the two independent rain probabilities. Author (ESA)

N81-31446# Fondazione Ugo Bordoni, Rome (Italy).
RECOGNITION TEST FOR AN OPEN SET OF TALKERS REPRESENTED BY THEIR ACOUSTIC PARAMETERS
Antonio Federico (Comitato Nazionale per l'Energie Nucleare), Giovanni Ibba, Andrea Paoloni, and Roberto Ragona (Comitato Nazionale per l'Energie Nucleare) Mar. 1981 6 p refs Presented at 4th Symp. F.A.S.E., Venice, Apr. 1981
(FUB-2-1981) Avail: NTIS HC A02/MF A01

A method based on a precise statistical formulation is presented which allows the use of a limited set of acoustic parameters for the recognition of the speaker in an open test. A number of speech realizations are collected for a group of different speakers. A second collection is made of utterances to be compared with the known speakers. In the general case a new utterance may not belong to any of the talkers referred to the test. Error of false identification and rejection is estimated as a measure of procedure effectiveness. Some considerations are made about the feasibility of the proposed method in the field practice of speaker recognition. ESA

N81-31447# Fondazione Ugo Bordoni, Rome (Italy).
COEXISTENCE OF ONE OR MORE FREQUENCY SHIFT KEYING MODULATION NUMERICAL CHANNELS WITH FREQUENCY DIVISION MULTIPLEXING-FREQUENCY MODULATION NETWORKS AT 4, 6 AND 7 GHz [COESISTENZA DI UNO O PIU CANALI NUMERICI CON MODULAZIONE FSK NELLE CANALIZZAZIONI DFM-FM A 4-6 E 7 GHz]
Aldo Andreozzi, Romano Arlotta (Ist. Superiore delle Poste e delle Telecomunicazioni), Ettore Carcani (Ist. Superiore delle Poste e delle Telecomunicazioni), and Dario DiZenobio Apr. 1981 10 p refs In ITALIAN
(FUB-4-1981) Avail: NTIS HC A02/MF A01

The coexistence of analog and numerical channels in the same network is investigated in order to explore the utilization of existing radio link frequency bands and equipment to provide additional digital transmission circuits. The coexistence of a 4 FSK channel with incoherent detection with an 1800 channel telephonic network is demonstrated. Interfacing blocks are introduced both in the transmitter and the receiver. A binary to quaternary coding device and a pulse shape filter are implemented in the transmitter. A fast analog to digital converter and a level decoder are implemented in the receiver. The limits imposed to the digital channel optimization by the coexistent analog system are discussed. Author (ESA)

N81-31448# Federal Communications Commission, Washington, D. C. Office of Science and Technology.
THE ROLE OF AN ELECTROMAGNETIC ENVIRONMENT MODEL IN SPECTRUM MANAGEMENT
Arthur H. Feller 6 Apr. 1981 66 p refs Presented at the IEEE 31st Vehicular Technol. Conf., Washington, D.C., 6-8 Apr. 1981
(PB81-194672; FCC/OST/TM-81-1) Avail: NTIS HC A04/MF A01 CSCL 17B

The role of an electromagnetic (EM) environment model in spectrum management is developed. Spectrum management is traced from electromagnetic compatibility (EMC) considerations in international agreements through related domestic law to the fundamental spectrum management procedures allocation, allotment, assignment. The need for a model of the EM environment is derived from requirements of allocation, allotment, and assignment proceedings. Data elements required to support and EM environment model for spectrum management purpose are reviewed. An outline and derivation of a general EM environment model is given. The ways systems respond to the EM environment are cataloged and reviewed so that specific applications of an EM environment model are readily apparent. Application and limitations of current models are discussed.GRA

N81-31449# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
AURAL COMMUNICATION IN AVIATION
K. E. Money, ed. Jun. 1981 184 p refs Presented at the Aerospace Med. Panel Specialist Meeting, Soesterberg, Netherlands, 30 Mar. - 2 Apr. 1981
(AGARD-CP-311; ISBN-92-835-1388-6) Avail: NTIS HC A09/MF A01

In modern military aircraft, it is essential that aircrew should be able to perceive and respond to audio information with minimum effort and highest reliability. However, the low quality of most airborne voice communications systems imposes such a high additional workload that messages are liable to misinterpretation or to being missed altogether. Reliable voice communication and the effective use of audio warnings are discussed. Hearing standards and conservation techniques are reported. For individual titles, see N81-31450 through N81-31475.

N81-31450# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
VOICE COMMUNICATION RESEARCH AND EVALUATION SYSTEM
Richard L. McKinley *In* AGARD Aural Commun. in Aviation Jun. 1981 7 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

The basic system is comprised of a multistation voice communication network consisting of the USAF standard aircraft intercommunication system, a standard A-19 diluter demand oxygen regulation system and an on line computer data collection and data analysis system that displays results in real time. The system is housed in a large reverberation chamber containing a programmable sound source capable of reproducing the spectrum and level of any AF operational noise environment. Standardized voice communication effectiveness test materials are used to assess the performance of any aspect of the total voice communication link, however, emphasis is usually placed upon the performance of the aircrew members. Examples of its application to voice communication problems are provided. T.M.

N81-31451# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
VOICE COMMUNICATIONS JAMMING RESEARCH
Thomas J. Moore *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

The effect of various types of jammers, J/S power ratios and background noise levels on voice communication materials processed by a standard Air Force voice communication system was evaluated. The measurement instruments employed were the Modified Rhyme Test (MRT) and a nonstandard voice communication performance task. Good agreement is found between the two measurement instruments in ranking the relative effectiveness of the jammers evaluated. The effect of training on naive subjects' ability to listen to voice communications under conditions of noise and jamming was studied. The results of this exploratory study indicate that training improved the performance of the listeners under all conditions tested. T.M.

N81-31452# Naval Aerospace Medical Research Lab., Pensacola, Fla.
PHONOLOGICAL VARIANTS IN MEDIAL STOP CONSONANTS UNDER SIMULATED OPERATIONAL ENVIRONMENTS: IMPLICATIONS FOR VOICE ACTIVATED CONTROLS IN AIRCRAFT
James D. Mosko, Roger W. Remington, and Glenn R. Griffin *In* AGARD Aural Commun. in Aviation Jun. 1981 4 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

A motion disorientation test was used to determine potential effects on voice characteristics. Speech samples from 14 subjects were obtained under a STATIC (control) and a DYNAMIC (experimental) condition. The 10 subjects completing both phases of the test did not exhibit significant changes in fundamental frequency, word token duration, or voice level. Four subjects who voluntarily curtailed the DYNAMIC mode exhibited significant changes in the same acoustic characteristics. The implications of these results for automatic speech recognition are discussed. DOE

N81-31453# Naval Aerospace Medical Research Lab., Pensacola, Fla.
CLEAR SPEECH: A STRATEGEM FOR IMPROVING RADIO COMMUNICATIONS AND AUTOMATIC SPEECH RECOGNITION IN NOISE
James D. Mosko *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

The acoustic characteristics of conversational speech production and clear speech production were compared for three different talkers. Increases in fundamental frequency, word token duration, and voice level for the clear speech were obtained. These results are compared to the results of similar studies and

implications for improved intelligibility of speech and automatic speech recognition are discussed. T.M.

N81-31454# Army Avionics Research and Development Activity, Fort Monmouth, N. J.

ELECTRONIC VOICE COMMUNICATIONS IMPROVEMENTS FOR ARMY AIRCRAFT

Mitchell S. Mayer and Arthur W. Lindburg *In* AGARD Aural Commun. in Aviation Jun. 1981 12 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

A communications system for Army aircraft, and two specifications which contain the test procedures required to accurately test and evaluate the various components of the communication system are decribed. The components of the system include: high impedance dc powered noise cancelling microphones; earphone elements designed and tested to have flat frequency response when inside the circumaural earcup of the hearing protective device; and intercoms which replace positive peak clipping with fast acting AGC circuits and expander/compander circuits for maximum output signal without distortion, even under conditions of extreme stress. T.M.

N81-31455# Amsterdam Univ. (Netherlands).

THE EFFECT OF NOISE ON THE VESTIBULAR SYSTEM **c52**

W. J. Oosterveld, A. R. Polman (Royal Dutch Airlines, Schiphol), and J. Schoonheyt (Royal Dutch Airlines, Schiphol) *In* AGARD Aural Commun. in Aviation Jun. 1981 5 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

The aim of the study was to find out if men with a noise induced hearing loss had detectable functional changes in the functioning of their vestibular system. The study was carried out in a group of 29 technicians who had worked in the rather noisy environment of the workshop for more than five years and all had a hearing loss on both ears of more than 40 dB on the tone audiogram at the frequency of 4000 Hz. The vestibular examinations showed that 18 of the 29 persons (62%) had spontaneous nystagmus with a speed of the slow component exceeding 5 deg/second. A positional nystagmus exceeding 5 deg/second, appearing in three or more positions, was found in 24 subjects (83%). In all cases the nystagmus was direction fixed. A cervical nystagmus could be provoked in 17 subjects (59%). T.M.

N81-31456# Royal Air Force Inst. of Aviation Medicine, Farnborough (England). Flight Skills Sect.

THE SPEED OF RESPONSE TO SYNTHESIZED VOICE MESSAGES

John L. Wheale *In* AGARD Aural Commun. in Aviation Jun. 1981 11 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

The effectiveness of synthesized cockpit voice warning messages using measures of reaction time (RT) was evaluated. Research has shown that voice messages are comparable to audio warnings and that synthesized voice messages are easily recognizable at low signal to noise ratios. Four different warning arrangements were used of which three had a Votrax voice component. The four warning systems represent possible warning combinations for transport aircraft. Subjects had to deal with simulated emergencies while performing a psychomotor tracking task and monitoring ATC messages. Thirty commercial pilots took part in the study. Overall the four warning systems were equally effective in terms of RT. However, voice messages had significantly slower RT's than audio warnings. Voice messages and illuminated legends caused significantly less disruption of ATC monitoring than audio warnings. Pilots also consistently cross checked voice and audio inputs with visual indicators. T.M.

N81-31457# Southampton Univ. (England). Audiology and Human Effects Group.

ASSESSING THE EFFECTIVENESS OF AUDITORY WARNINGS **c53**

Peter A. Wilkins *In* AGARD Aural Commun. in Aviation Jun. 1981 13 p refs Sponsored in part by the United Kingdom Health and Safety Executive (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

Two laboratory experiments and a field study are described which found that while inattention need not necessarily impair the perception of an auditory warning, the combination of inattention and the need to recognize the warning may result in failures in the perception of sounds which can be heard and recognized when listened for deliberately. The results indicated that to be effective a warning sound should be distinct from both the ambient noise and other nonsimultaneous discrete sounds present. T.M.

N81-31458# Air Force Inst. of Aviation Medicine, Manching (West Germany).

VOICE WARNING SYSTEMS: SOME EXPERIMENTAL EVIDENCE CONCERNING APPLICATION

Michael Reinecke *In* AGARD Aural Commun. in Aviation Jun. 1981 8 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

Two experiments with voice warning systems (VWS), one in a helicopter UH-1D and the other one in a F 104 flight simulator are described. In the first experiment recognition times to identify simulated failures were measured in cruise and low level flights with 5 pilots. It was proved that voice warnings compared to light warnings do reduce recognition time. This is especially true during low level flight, and when only precise warning texts are used. In the second experiment the interaction of voice warnings and radio communication was investigated. Eleven pilots had to do a navigation flight and to react with correct emergency procedures when failures were introduced. Reaction times suggest that additional light warnings tend to slow down pilots reactions. The findings stress the possibility that the pilot might become overloaded when voice warnings do occur while radio communication is going on. T.M.

N81-31459# Human Engineering Labs., Aberdeen Proving Ground, Md.

THE BACKGROUND AND BASES FOR THE PROPOSED MILITARY STANDARD ON ACOUSTICAL NOISE LIMITS IN HELICOPTERS **c71**

Georges R. Garinther and David C. Hodge *In* AGARD Aural Commun. in Aviation Jun. 1981 9 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

A design standard for interior noise of helicopters was prepared to provide the developer and user with realistic noise limits which consider hearing damage risk, speech intelligibility, mission profile, state-of-the-art in noise reduction, and helicopter weight. The levels selected meet the current hearing conservation limits of the Department of Defense and permit electrically aided sentence intelligibility of 98%. Helicopters below 20,000 pounds are treated separately from those above because of the strong positive relation between internal noise and vehicle gross weight. This standard defines the locations and flight conditions under which noise measurements shall be made for compliance. It also specifies the types of instrumentation and the test procedures to be used to collect interior noise level data. T.M.

N81-31460# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE EFFECT OF NOISE-INDUCED HEARING LOSS ON THE INTELLIGIBILITY OF SPEECH IN NOISE

G. F. Smoorenburg, J. A. P. M. deLaat, and R. Plomp *In* AGARD Aural Commun. in Aviation Jun. 1981 8 p refs (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

Speech reception thresholds, both in quiet and in noise, and tone audiograms were measured for 14 normal ears (7 subjects) and 44 ears (22 subjects) with noise-induced hearing loss. Maximum hearing loss in the 4-6 kHz region equalled 40 to 90 dB (losses exceeded by 90% and 10%, respectively). Hearing loss for speech in quiet measured with respect to the median speech reception threshold for normal ears ranged from 1.8 dB to 13.4 dB. For speech in noise the numbers are 1.2 dB to 7.0 dB which means that the subjects with noise-induced hearing loss need a 1.2 to 7.0 dB higher signal-to-noise ratio than normal to understand sentences equally well. A hearing loss for speech of 1 dB corresponds to a decrease in sentence intelligibility of 15 to 20%. The relation between hearing handicap conceived as a reduced ability to understand speech and tone audiogram

is discussed. The higher signal-to-noise ratio needed by people with noise-induced hearing loss to understand speech in noisy environments is shown to be due partly to the decreased bandwidth of their hearing caused by the noise dip. T.M.

N81-31461# Royal Netherlands Air Force, Soesterberg. Aeromedical Dept.

HEARING STANDARDS FOR AIRCREW **c52**

Martin P. C. Gloudemans *In* AGARD Aural Commun. in Aviation Jun. 1981 4 p (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

Standards for aircrew in six NATO countries were examined. The large discrepancy in audiometric requirements from country to country is discussed. Emphasis is placed on those tests that examine speech recognition in quiet and in noise environments. T.M.

N81-31462# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

COMPARATIVE INTELLIGIBILITY OF SPEECH MATERIALS PROCESSED BY STANDARD AIR FORCE VOICE COMMUNICATION SYSTEMS IN THE PRESENCE OF SIMULATED COCKPIT NOISE

Thomas J. Moore, Charles W. Nixon, and Richard L. McKinley *In* AGARD Aural Commun. in Aviation Jun. 1981 5 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

Among the systems evaluated was the ARC-164 radio which will serve as the reference system against which the performance of jam-resistant, secure systems developed in the immediate future will be compared. Relative differences found between male and female talkers under various levels of simulated cockpit noise are reported. T.M.

N81-31463# Institute of Aviation Medicine, Oslo (Norway).

SECOND LANGUAGE SPEECH COMPREHENSION IN NOISE: A HAZARD TO AVIATION SAFETY

Hans M. Borchgrevink *In* AGARD Aural Commun. in Aviation Jun. 1981 5 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

Simple Norwegian and English sentences were read by a bilingual adult, tape recorded and presented individually to bilingual adults with English or Norwegian as their first language and good command of the other. Each 65 dB sentence was first presented in so strong background USASI noise (75dB) that it could not be perceived, and was repeated with the noise level progressively reduced in 2 dB steps from presentation to presentation until the sentence was adequately repeated by the subject. The results demonstrated that for both groups the first (native) language sentences were correctly repeated after fewer presentations, that is at a lower signal-to-noise ratio, than the second language sentences. The difference between the first (native) language comprehension threshold and the second language comprehension threshold was statistically significant for both the Norwegian and the English subject groups. T.M.

N81-31464# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).

THE EFFECTS OF EAR PROTECTORS AND HEARING LOSSES ON SENTENCE INTELLIGIBILITY IN AIRCRAFT NOISE

G. R. Froehlich *In* AGARD Aural Commun. in Aviation Jun. 1981 2 p (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

Flight line personnel with hearing defects often complain that face-to-face speech communication in noise is considerably reduced when ear protectors are worn. Whether this could be confirmed or not was determined. An effective noise protecting flight helmet changes the flat aircraft cabin noise spectrum into a spectrum with predominance of lower frequencies. Whether the additional wearing of earplugs under the ear cups might improve speech perception was investigated. T.M.

N81-31465# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

STI: AN OBJECTIVE MEASURE FOR THE PERFORMANCE OF VOICE COMMUNICATION SYSTEMS

Tammo Houtgast and Herman J. M. Steeneken *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

A measuring device was developed for determining the quality of speech communication systems. It comprises two parts, a signal source which replaces the talker, producing an artificial speech-like signal, and an analysis part which replaces the listener, by which the signal at the receiving end of the system under test is evaluated. Each single measurement results in an index (ranging from 0-100%) which indicates the effect of that communication system on speech intelligibility. The index is called STI (Speech Transmission Index). A careful design of the characteristics of the test signal and of the type of signal analysis makes the present approach widely applicable. It was verified experimentally that a given STI implies a given effect on speech intelligibility, irrespective of the nature of the actual disturbance (noise interference, band-pass limiting, peak clipping, etc.). T.M.

N81-31466# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

SOME APPLICATIONS OF THE STI-METHOD IN EVALUATING SPEECH TRANSMISSION CHANNELS

Herman J. M. Steeneken and Tammo Houtgast *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

A description is given of a measuring device for the application of the STI-method. The application of the device in evaluating speech communication channels as radio communication links, digital communication channels and microphones and telephones in noisy environments is demonstrated. Consequently the STI might well be used as a design specification for speech communication systems. T.M.

N81-31467# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

VOICE COMMUNICATION CAPABILITY OF SELECTED INFLIGHT HEADGEAR DEVICES

Richard L. McKinley, Charles W. Nixon, and Thomas J. Moore *In* AGARD Aural Commun. in Aviation Jun. 1981 8 p (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

The voice communication effectiveness (MRT word intelligibility) of selected Air Force communications terminal equipment was evaluated in simulated operational noise environments. Analyses of the resulting data indicate: standard AF communications headsets H-133, HGU-26/P and H-157 performed in a manner consistent with their purposes with the H-133 providing the best communication, the HGU-26/P second and the H-157 third; percent correct intelligibility in the 115 dB noise condition was reduced as much as 15% for the H-133 and 50% for the H-157 over the ambient noise condition; communication performance varied over 5 to 10 percent when used with the AIC vs the AIC and RF radio; and the UK chemical defense hood provided a slightly better talking environment than the MBU-5/P and a worse listening environment than the HGU-26/P. T.M.

N81-31468# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

AN AUTOMATED MULTIPLE CHOICE INTELLIGIBILITY TESTING SYSTEM

R. L. Pratt *In* AGARD Aural Commun. in Aviation Jun. 1981 3 p ref (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

The test material used is the Modified Rhyme Test and the Clarke's Vowel Test (CVT). The MRT consists of groups of single syllable words which differ only in their initial or final consonant; for the CVT only the vowel is different. The relative performance of various noise cancelling microphones was compared by recording MRT and CVT word lists against a background of rotary wing noise provided using a prerecorded sample formed into a tape loop. The word lists were then replayed to subjects, seated in the same noise environment used for the recordings, through a communications headset with attenuation properties similar to helmets used in rotary wing aircraft. Subjects were required to select the word they thought they heard from a

group of six words (five in the case of the CVT) presented on a Visual Display Unit (VDU). It is suggested that subjects' reaction time, when used in conjunction with the percentage correct score, may assist in discriminating between microphones of comparable performance. T.M.

N81-31469# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).

EFFECTS OF AGE, FLYING TIME AND TYPE OF AIRCRAFT ON THE HEARING OF GERMAN MILITARY PILOTS, AND ITS SIGNIFICANCE FOR INFLIGHT COMMUNICATION **c52**

G. R. Froehlich *In* AGARD Aural Commun. in Aviation Jun. 1981 3 p (For primary document see N81-31449 22-35)
Avail: NTIS HC A09/MF A01

The analysis of pure tone audiograms of 4,034 German military pilots revealed that 73% of total ears have normal hearing up to at least 6000 Hz, 26% have only very slight hearing losses above 2000 Hz with 22 + or 14 dB at 3000 Hz, 36 + or - 18 dB at 4000 Hz, and 40 + or - 18 dB at 6000 Hz. This allows reliable speech communication in every day life and aboard the aircraft. The total of marked hearing losses requiring a waiver was 0.65%, mostly unilateral with prevalence of the left ears and induced by impact noise on the shooting range in the early stages of the career. Thus, from the pilots' side, all higher speech frequencies are available for improved voice communication systems and should be used in high noise environment. T.M.

N81-31470# Southampton Univ. (England). Inst. of Sound and Vibration Research.

AN ACTIVE NOISE REDUCTION SYSTEM FOR AIRCREW HELMETS **c71**

P. D. Wheeler and S. G. Halliday *In* AGARD Aural Commun. in Aviation Jun. 1981 8 p ref Sponsored in part by Ministry of Defense (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

A system was developed in which the acoustic noise field inside the ear defender is detected using a miniature microphone, and an antiphase signal is fed back to a communications telephone within the ear defender. The objectives for this development were to improve speech intelligibility, and to reduce noise exposure. In laboratory trials, a group of eighteen subjects, wearing an ANR-modified helmet, were exposed to an external noise field similar to that experienced by aircrew in a high performance strike aircraft. Comparisons of attenuation and speech intelligibility scores, with and without the ANR system in operation, were made. The modified helmet's performance was also compared to that of the standard helmet. In order to eliminate user controls, an adaptive control facility was added which optimises the degree of noise cancellation to compensate for variations in helmet fit between wearers. T.M.

N81-31471# Army Aeromedical Research Lab., Fort Rucker, Ala.

HEARING IMPAIRED AVIATORS IN THE U.S. ARMY **c52**

Susan Liff and Jerod L. Goldstein *In* AGARD Aural Commun. in Aviation Jun. 1981 3 p ref (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

An audiometric profile of a group of US Army aviators who had failed to meet the minimal acceptable hearing loss standard and were granted permission to continue to fly under medical waiver is presented. The flight safety records of this group were evaluated to determine if any relationship existed between hearing loss and flight mishaps or accidents involving these individuals. T.M.

N81-31472# Ministry of Defence, London (England). Directorate of Civilian Medical Services.

HEARING CONSERVATION **c52**

S. Kanagasabay *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

Impairment of hearing is one of the adverse effects of noise. The measures adopted to minimize hearing impairment, conveniently termed Hearing Conservation, include specifying an acceptable noise exposure, identification of personnel at risk, provision of suitable protective equipment, limitation of exposure time where this is necessary and medical monitoring by audiometry. Proposals in the United Kingdom for noise criteria and for audiometry in industry are presented. T.M.

N81-31473# Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.

FLYING HELMET ATTENUATION, AND THE MEASUREMENT, WITH PARTICULAR REFERENCE TO THE Mk 4 HELMET **c71**

G. M. Rood *In* AGARD Aural Commun. in Aviation Jun. 1981 13 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

To predict the intelligibility of communication systems, it is necessary to be able to measure helmet attenuation accurately and repeatably, and it is this particular aspect which is highlighted. Some of the results from a comprehensive series of tests involving subjective and semiobjective measurement of the attenuation of noise by flying helmets are discussed. The analysis shows that the semiobjective method of ascertaining hearing protector or flying helmet attenuation, using miniature measuring microphones, is a viable alternative to the existing standard REAT methods, and has considerable advantages in providing more useful information in less time. Additionally, high correlations exist between laboratory and in-flight mesurements of attenuation, clearly indicating that laboratory measurements reproduce helmet attenuation actually found in the air. T.M.

N81-31474# Naval Avionics Center, Indianapolis, Ind. Applied Research Dept.

A MULTIPLEXED DIGITAL VOICE INTERCOMMUNICATIONS SYSTEM COMPATIBLE WITH FUTURE VOICE CONVERSION TECHNIQUES

Richard F. Bolt and Barry D. Sanderson *In* AGARD Aural Commun. in Aviation Jun. 1981 7 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

This system will be usable in a variety of aircraft. The individual stations are interchangeable from aircraft-to-aircraft, and the stations are comprised of plug-in modules that can be easily replaced by maintenance personnel. This modularity allows the system to be updated with future voice conversion techniques without rework or redesign. Currently available voice conversion techniques were evaluated for intelligibility in some military acoustic noise environments. A detailed description of the system is presented. T.M.

N81-31475# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Behavioral Sciences Div.

SIDETONE-LEVEL CONSIDERATIONS IN AIRCRAFT COMMUNICATION SYSTEMS

S. E. Forshaw *In* AGARD Aural Commun. in Aviation Jun. 1981 5 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

It is known that the loudness of an individual's speech is governed by two possibly related feedback phenomena: the 'sidetone-amplification effect', the tendency for a speaker to decrease his vocal effort when he hears his voice at an amplified level, and the 'Lombard effect', the tendency for a speaker to increase his vocal intensity in the presence of noise. The limited noise cancelling capabilities of current microphones are the major source of system amplified noise listeners ears. It may be possible to reduce the level of this source of noise, and hence increase a system's signal to noise ratio and speech intelligibility, by optimizing the level of a speaker's transmit sidetones to elicit an increase in his vocal output. T.M.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N81-31476* Galileo Electro-Optics Corp., Sturbridge, Mass.

INFINITE GAMMA DEVICE PROGRAM Final Report

Paul R. Henkel 15 Nov. 1976 32 p refs
(Contract NAS5-20591)
(NASA-CR-166707) HC A03/MF A01 CSCL 09A

The device relies for its operation upon nonlinear electron multiplication in a special microchannel plate. A historical summary is presented and the series of optical and electrical experiments which mathematically defined operation of the infinite gamma device in terms of its critical parameters is described. The required operating characteristics of the nonlinear microchannel plate are compared to the operating characteristics actually achieved. T.M.

N81-31477 Stanford Univ., Calif.
STATISTICS OF NOISE IN PHOTODETECTION: APPLICATIONS IN MAGNETO-OPTICAL RECORDING Ph.D. Thesis
Masud Mansuripur 1981 150 p
Avail: Univ. Microfilms Order No. 8115809

A systematic framework is presented for analyzing read, write, and erase processes in magneto-optical disk systems. Noise in opto-electronic systems, quantum noise in photodiodes, thermal noise in electronic circuitry, multiplication noise in avalanche diodes, and the noise originating in the optical channel are considered. A rigorous expression that relates error rates to system parameters is derived and, for a typical set of parameters the results of this rigorous treatment are compared with those obtained by the Gaussian approximation to the statistics of noise. It is concluded that under most conditions the Gaussian approximation yields satisfactorily accurate predictions and that the signal to noise ratio can be used as a measure of performance for digital optical detectors. Dissert. Abstr.

N81-31478 Illinois Univ. at Chicago Circle, Chicago.
MODE THEORY FOR AN EQUILATERAL TRIANGULAR DIELECTRIC WAVEGUIDE Ph.D. Thesis
Seh-Hoon Yun 1981 149 p
Avail: Univ. Microfilms Order No. 8116112

The propagating mode characteristics of an equilateral triangular dielectric waveguide whose top and bottom regions have different refractive indices were investigated using the ray-optics method based on the geometrical optics approximation and the wave-optics method. In the ray-optics approach, the guiding modes were obtained by imposing the field amplitude and phase conditions as the ray travels along the guide. In the wave-optics approach, the propagating modes were obtained by applying Marcatili's approximation to the equilateral triangular guide. The accuracies of the computed propagation constants obtained by these methods were tested by comparing them with those given by James and Yeh curves for a triangular core fiber. The ray-optics method gives better results than the wave-optics method near the cutoff region. Dissert. Abstr.

N81-31479 Michigan Univ., Ann Arbor.
TWO-DIMENSIONAL SIMULATION OF GaAs MESFETS USING THE FINITE ELEMENT METHOD Ph.D. Thesis
Steven Eric Laux 1981 298 p
Avail: Univ. Microfilms Order No. 8116279

The methodology involved in applying the finite element method to two dimensional semiconductor simulation is discussed. The specific application of this methodology to the study of the GaAs MESFET is also considered. Dissert. Abstr.

N81-31480*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADAPTIVE CONTROL SYSTEM FOR LINE-COMMUTATED INVERTERS Patent Application
Carlisle R. Dolland (AiResearch Mfg. Co., Torrance, Calif.) and David Bailey, inventors (to NASA) (AiResearch Mfg. Co., Torrance, Calif.) Filed 7 Aug. 1981 14 p Sponsored by NASA
(NASA-Case-MFS-25209-1; US-Patent-Appl-SN-291132) Avail: NTIS HC A02/MF A01 CSCL 09C

A control system for a permanent-magnet motor driven by a multiphase line-commutated inverter is described. It is provided with integrators for integrating the back EMF of each phase of the motor for use in generating system control signals for an inverter gate logic using a sync and firing angle control generator connected to the outputs of the integrators. A precision full-wave rectifier provides a speed control feedback signal to a phase-delay rectifier via a gain and loop compensation circuit and to the integrators for adaptive control of the attenuation of low frequencies by the integrators as a function of motor speed. As the motor speed increases, the attenuation of low frequency components by the integrators is increased to offset the gain of the integrators to spurious low frequencies. While the attenuation may be a continuous linear function of speed, a switch is employed to provide a step change in attenuation at 40% of speed. NASA

N81-31481*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADAPTIVE REFERENCE VOLTAGE GENERATOR FOR FIRING ANGLE CONTROL OF LINE-COMMUTATED INVERTERS Patent Application
Carlisle R. Dolland, inventor (to NASA) (Garrett Corp., Torrance, Calif.) Filed 7 Aug. 1981 18 p Sponsored by NASA
(NASA-Case-MFS-25215-1; US-Patent-Appl-SN-291131) Avail: NTIS HC A02/MF A01 CSCL 09C

A control system for a permanent-magnet motor driven by a multiphase line-commutated inverter is described. It is provided with integrators for integrating the back EMF of each phase of the motor for use in generating system control signals for an inverter gate logic using a sync and firing angle control generator connected to the outputs of the integrators. The firing angle control signals are produced by the control generator by means for combining 120 deg segments of the integrated back EMF signals symmetrical about their maxima into composite positive and negative waveforms, and means for sampling the maxima of each waveform every 120 deg. These samples are then used as positive and negative firing angle control signals, whereby any change in amplitude of the integrated back EMF signals will not affect a change in the operating power factor of the motor and inverter. NASA

N81-31482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH STABILITY BUFFERED PHASE COMPARATOR Patent Application
Victor S. Reinhardt and William A. Adams, inventors (to NASA) Filed 17 Jul. 1981 20 p
(NASA-Case-GSC-12645-1; US-Patent-Appl-SN-284314) Avail: NTIS HC A02/MF A01 CSCL 09C

A low noise RF signal phase comparator comprised of two high stability driver buffer amplifiers driving a double balanced mixer which operate to generate a beat frequency between the two RF input signals coupled to the amplifiers from the RF sources is described. The beat frequency output from the mixer is applied to a low noise zero crossing detector which is the phase difference between the two RF inputs. Temperature stability is provided by mounting the amplifiers and mixer on a common circuit board with the active circuit elements located on one side of a circuit board and the passive circuit elements located on the opposite side. A common heat sink is located adjacent the circuit board. The active circuit elements are embedded into the bores of the heat sink which slows the effect of ambient temperature changes and reduces the temperature gradients between the active circuit elements, thus improving the cancellation of temperature effects. The two amplifiers include individual voltage regulators, which increases RF isolation. NASA

N81-31483*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
UNEQUAL SPLIT MICROWAVE POWER DIVIDER Patent Application
Marion Crawford Bailey, inventor (to NASA) Filed 30 Jul. 1981 11 p
(NASA-Case-LAR-12889-1; US-Patent-Appl-SN-288434) Avail: NTIS HC A02/MF A01 CSCL 09C

An unequal split in-phase microwave power divider is described. A power signal is applied to a power divider that produces two signals that are equal and out of phase. These two signals are applied to a quadrature hybrid that produces two signals at the output terminals and that are unequal and in-phase. NASA

N81-31484# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary Report, 1 Nov. 1980 - 31 Jan. 1981

Alan J. McLaughlin 15 Feb. 1981 23 p
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A102144; ESD-TR-81-4) Avail: NTIS HC A02/MF A01 CSCL 09/3

This report deals with the Data Systems Division 2: Advanced Circuit Design and Simulation; RVLSI Technology; Semiconductor Processing; and Device Theory, Test, and Modeling. Solid State - Division 8: Solid State Device Research; Quantum Electronics; Materials Research; Microelectronics; and Analog Device Technology. GRA

N81-31485# TRW Semiconductors, Inc., Lawndale, Calif. Semiconductor Div.

MONOLITHIC LUMPED ELEMENT INTEGRATED CIRCUIT (M2LEIC) TRANSISTORS Final Report, period ending Jul. 1980

Al Harrington and George Schreyer Dec. 1980 222 p refs
(Contract N00173-77-C-0340)
(AD-A102334) Avail: NTIS HC A10/MF A01 CSCL 09/5

An advanced silicon technology has been developed which allows the monolithic intergration of high-power microwave power transistors and passive impedance matching networks on the same silicon chip. Up to 40W CW has been obtained at 1 GHz. GRA

N81-31486# California Univ., Livermore. Lawrence Livermore Lab.

AMBIPOLAR POTENTIAL FORMATION IN TMX

D. L. Correl, S. L. Allen, T. A. Casper, J. F. Clauser, P. Coakley, F. H. Coesgen, W. Condit, W. C. Cummins, J. C. Davis, and R. P. Drake 5 May 1981 23 p refs Presented at the Workshop on Ambipolar Potential Formation and Control in Bumpy Tori and Mirrors, Oak Ridge, Tenn., 11-12 May 1981
(Contract W-7405-eng-48)
(UCRL-85828-Rev-1; CONF-810511-4-Rev-1) Avail: NTIS HC A02/MF A01

The TMX experimental data on ambipolar potential control and on the accompanying electrostatic confinement are reported. New results on the radial dependence of the central cell confining potential are given. Radial and axial particle losses as well as scaling of the central cell axial confinement are discussed. DOE

N81-31487# Washington Univ., Seattle. Inst. for Nuclear Theory.

PARTIALLY CONSERVED AXIAL-CURRENT NONCANONICALITY AND THE SIGMA COMMUTATOR

M. K. Banerjee and Gerald A. Miller 1980 49 p refs Prepared in cooperation with Maryland Univ., College Park
(Contracts DE-AS05-76ER-05126; DE-AC06-76ER-01388)
(DOE/ER-05126/T2; RLO-1388-856; ORO-5126-135) Avail: NTIS HC A03/MF A01

The pion nucleon sigma commutator, sigma (pi N), was studied using the quark mass term as the mechanism for chiral symmetry breaking. The resulting expression for the divergence of the axial vector current is not a canonical field as conjectured in the hypothesis of partially conserved axial vector current. This produces a significant modification of the relationship between the soft pion limit of isoscalar pion nucleon scattering amplitude and sigma (pi N). Thus the analysis of pi N scattering data yields not the true sigma commutator but what we call the apparent sigma commutator, sigma sub A. The latter is a sum of sigma (pi N) and a contribution from the noncanonicality of the divergence of the axial vector current. A pionically amended quark bag model (the Cloudy Bag Model) was used to calculate sigma sub A. DOE

N81-31488# Illinois Univ., Urbana. Materials Research Lab.

ELECTRONIC PHENOMENA AT HIGH PRESSURE

H. G. Drickamer 1981 17 p refs Presented at the Symp. on Pressure as a Tool and as an Environment, Washington, D.C., 8 Jun. 1981
(Contract DE-AC02-76ER-01198)
(DOE/ER-01198/1350; CONF-810641-1) Avail: NTIS HC A02/MF A01

High pressure research on electronic phenomena is surveyed. Control of the distribution and rate of crossing between the excited state conformations by varying the viscosity of the medium is described. Investigations into the effect of pressure on the emission efficiency of rare earth chelates are described. The chemical reactivity of the new ground states of electron donor-acceptor complexes induced at high pressure is discussed. DOE

N81-31489# California Univ., Livermore. Lawrence Livermore Lab.

AUTOMATIC TEST SYSTEM FOR CCDS

C. F. McConaghy Jun. 1981 8 p
(Contract W-7405-eng-48)
(UCID-19077) Avail: NTIS HC A02/MF A01

An automatic test system for measuring the AC characteristics of charge coupled devices (CCD) is described. Throughput is increased and necessity of having an operator present to make numerous tedious measurements is removed. The test system measures the diffusion voltage at which charge first injects into the CCD. In addition, it measures the output amplitude in millivolts corresponding to a full well condition. The value of charge transfer efficiency (CTE) is returned when biased at full well so a decision can be made whether a particular CCD channel is good or bad. The system is currently set up to measure a five channel including a four channel SPS CCD. Each CCD channel is characterized separately. DOE

N81-31490# Sandia Labs., Albuquerque, N. Mex.

ELECTROMAGNETIC THETA GUN AND TUBULAR PROJECTILES

T. J. Burgess, E. C. Cnare, W. L. Oberkampf, S. G. Beard, and M. Cowan Dec. 1980 58 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-1988) Avail: NTIS HC A04/MF A01

The Theta gun is described and compared with the rail gun. The Theta gun applies the propelling force along the length of its projectile. This is shown to allow much greater acceleration of high fineness ratio projectiles for a given barrel pressure, allowing much shorter barrels for military applications. A computer code which simulates performance of the Theta gun is described and experimental results from a few simple, low energy experiments show close agreement with code predictions. Trajectories and aerodynamic heating for three candidate military projectiles are calculated for vertical and horizontal atmospheric launches where initial velocity is as high as 3 km/s. The calculations indicate that in some cases a thin layer of heatshield will be required to control projectile heating. DOE

N81-31491# Lincoln Lab., Mass. Inst. of Tech., Lexington.

ANALYSIS AND TEST OF LINE-COMMUTATED INVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS

E. E. Landsman Feb. 1981 87 p refs
(Contract DE-AC02-76ET-20279)
(DOE/ET-20279/115) Avail: NTIS HC A05/MF A01

The line commutated inverter is used in a number of utility interactive photovoltaic power systems because it is both readily available and attractively priced. This inverter is basically a phase controlled rectifier operating in the regenerative mode. A detailed theoretical analysis, coupled with actual circuit measurements, is leading to a better understanding of the inverter operation and should result in an improvement in the power factor and a reduction of harmonic currents. The normalized results of the theoretical analysis and of test data and waveforms are presented. DOE

N81-31492# AEG-Telefunken, Ulm (West Germany). Geschaeftsbereich Roehren und Baugruppen.

GAS-DISCHARGE MATRIX DISPLAY Final Report

Kurt Fahrenschon, Werner Dirr, Wolfgang Hellwig, Hildegard Keiner, Guenther Peppel, and Helmut Suessenbach Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-082; ISSN-0340-7608) Avail: NTIS HC A04/MF A01

The physical and technological principles of a pulsed gas discharge matrix display with inherent memory were investigated. The construction of the display panel consisting of priming channel, drift space and display cell is detailed. The display cell features a design with a wire cathode. Time delay investigations

show that reliable ignition of the discharge channels can be obtained. Author (ESA)

N81-31493# AEG-Telefunken, Frankfurt am Main (West Germany). Forschungsinst.

OPTICAL TRIGGERING OF POWER THYRISTORS Final Report

Dieter Silber, Wolfgang Winter, Marius Fuellmann, Karl-Julius Finck, and Helmut Maeder Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 113 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-083; ISSN-0340-7608) Avail: NTIS HC A06/MF A01

An optically sensitive thyristor gate structure was developed with optimized emitter shunts, allowing a good compromise between optical trigger sensitivity and du/dt-fault trigger stability. External, light activated auxiliary thyristors (external gate amplifiers) were produced. Optically sensitive gate structures were developed, which compensate du/dt-fault trigger potentials in the trigger bases allowing both high optical trigger sensitivity and high du/dt-stability. Author (ESA)

N81-31494# AEG-Telefunken, Ulm (West Germany). Geschaeftsbereich Roehren und Baugrupen.

DEVELOPMENT OF AN ELECTROSTATIC PRINTING PROCESS WITH GAS DISCHARGE RECORDING WRITING HEAD Final Report

Helmut Sussenbach, Willi Junge, and Werner Dirr Bonn Bundesministerium fuer Forschung und Technologie Nov. 1980 67 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-80-084; ISSN-0340-7608) Avail: NTIS HC A04/MF A01

A printing head for an electrostatic printer was investigated. Its writing electrodes are switched by a gas discharge array, consisting of a linear arrangement of discharge cells with the cathodes interconnected cyclically. A partial voltage for the writing electrodes is sequentially generated by probe electrodes in the discharge cells. The necessary charge needed to obtain a latent electrostatic image is transfered to the dielectric paper when probe electrode and backing electrode work in coincidence. This arrangement allows fewer switching transistors. Author (ESA)

N81-31495# National Bureau of Standards, Washington, D.C. Center for Building Technology.

EFFECTS OF THERMAL INSULATION ON ELECTRICAL CONNECTIONS AND OUTLET BOXES Final Report

Robert W. Beausoliel, James R. Clifton, and William J. Meese Apr. 1981 53 p refs Sponsored by DOE

(PB81-197006; NBSIR-81-2220) Avail: NTIS HC A04/MF A01 CSCL 13M

When residential walls are retrofitted with foamed-in urea formaldehyde or blown-in cellulose thermal insulations, the insulation may enter electrical outlet and switch boxes. The effects of these thermal insulations on the durability of electrical components were studied. These studies were carried out at 44, 75, and 96 percent relative humidities with test periods between one and twelve months. Laboratory test methods were developed and tests performed to determine the electrical and corrosive effects of urea formaldehyde and cellulose thermal insulation contained in electrical outlet and switch boxes. GRA

N81-31496# Bendix Corp., Baltimore, Md. Environmental and Process Instruments Div.

DETECTION INSTRUMENTATION FOR CABLE SHIELD DEFECTS Final Open File Report, 10 Oct. 1978 - 30 Jun. 1980

James R. Cosby, Gerald B. Gilbert, and Jay H. Stoudenmire 29 Aug. 1980 50 p refs

(Contract DI-BM-J0-188081)

(PB81-194540; BM-OFR-33-81) Avail: NTIS HC A03/MF A01 CSCL 14B

Portable instruments are evaluated for their effectiveness in detecting and locating damaged metallic shields in types SHD and SHC cables. A second phase of the program covers several instruments of a type that could prove effective and were modified, and tested to verify their performance. GRA

N81-31497*# National Bureau of Standards, Washington, D.C. Electron Devices Div.

POWER TRANSISTOR SWITCHING CHARACTERIZATION Annual Report, 1 Jul. 1979 - 30 Jun. 1980

David L. Blackburn Apr. 1981 29 p refs Sponsored in part by NASA, Lewis Research Center

(NASA-CR-164607; PB81-196347; NBSIR-81-2204) Avail: NTIS HC A03/MF A01 CSCL 09A

The switching properties of power transistors are investigated. The devices studied were housed in IO-3 cases and were of an n(+)-p-n(-)-n(+) vertical dopant structure. The effects of the magnitude of the reverse-base current and temperature on the reverse-bias second breakdown characteristics are discussed. Brief discussions of device degradation due to second breakdown and of a constant voltage turn-off circuit are included. A description of a vacuum tube voltage clamp circuit which reduces clamped collector voltage overshoot is given. GRA

N81-31498# National Bureau of Standards, Washington, D.C.

EXPERIMENTALLY DETERMINED PERFORMANCE OF SOME RESIDENTIAL CIRCUIT BREAKERS

Robert W. Beausoliel and William J. Meese Apr. 1981 50 p refs

(PB81-197048; NBSIR-81-2221) Avail: NTIS HC A03/MF A01 CSCL 09A

Results from laboratory testing of residential type, single-pole, 20 A, thermal-magnetic circuit breakers are presented. Standard 20 A plug fuses were tested for comparison with circuit breaker performance. GRA

N81-31499# National Bureau of Standards, Washington, D.C. Electrosystems Div.

ELECTRIC AND MAGNETIC FIELD MEASUREMENTS Annual Report

R. H. McKnight, F. R. Kotter, M. Misakian, and P. Ortiz Feb. 1981 73 p refs

(PB81-218182; NBSIR-81-2267) Avail: NTIS HC A04/MF A01 CSCL 09A

The NBS program concerned with developing methods for evaluating and calibrating instrumentation for use in measuring the electric field and various ion-related electrical quantities in the vicinity of high-voltage direct current (HVDC) transmission lines is described. Apparatus designed to simulate the transmission line environment is also considered. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N81-31500*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THERMAL CONDUCTION IN A COMPOSITE CIRCULAR CYLINDER: A NEW TECHNIQUE FOR THERMAL CONDUCTIVITY MEASUREMENTS OF LUNAR CORE SAMPLES

K. Horai (Lamont-Doherty Geological Observatory), J. L. Winkler, Jr. (Lockheed Electronics Co., Houston, Tex.), S. J. Keihm (Lamont-Doherty Geological Observatory), M. G. Langseth (Lamont-Doherty Geological Observatory), J. A. Fountain, and E. A. West 4 Jan. 1980 29 p refs Repr. from Phil. Trans. of the Roy. Soc. of London. Ser. A: Math. and Phys. Sci. (London), v. 293, no. 1406, 4 Jan. 180 p 571-598

(NASA-TM-82331; ISSN-0080-4614) Copyright.

Avail: Issuing Activity CSCL 20D

The core sample is heated from the outside at a known rate and the rise in temperature at the surface of the core tube is measured. Because the temperature at the surface, increasing with time, is a function of the thermal properties of both the core tube and the sample, the thermal properties of the sample can be estimated by comparing the measured temperature with the theory, provided that the thermal properties of the core tube are known. Thus it is not necessary to extract the sample from

the core tube to make the measurements. Neither is it necessary to insert a heater, or temperature sensor, into the sample within the core tube, as would be required if another method were applied. The sample remains intact after the measurements. The temperature change in the sample can be kept to a minimum as long as the thermal conductivity determination is possible with a reasonable precision. If the radiative method of heat transfer is chosen, the core tube will only be in mechanical contact with the sample holder and a sensor attached to the core tube to measure the surface temperature, thereby greatly reducing the possibility of disturbing the sample. T.M.

N81-31501 Ohio State Univ., Columbus.
THERMAL INSTABILITY AND CONVECTION IN A HORIZONTAL LAYER OF TWO IMMISCIBLE FLUIDS WITH INTERNAL ENERGY GENERATION Ph.D. Thesis
Anh-Tri Nguyen 1981 310 p
Avail: Univ. Microfilms Order No. 8115141

Experimental and theoretical investigations of thermal convection in a horizontal layer composed of two immiscible fluids with uniform internal energy generation in the lower sublayer are discussed. A linear stability analysis, numerical study, and experimental measurements are presented, and an attempt to utilize the overall results to develop a general semiempirical heat transfer correlation is made. The fluid layer is bounded from below by a rigid, insulated surface and from above, by a rigid isothermal surface. The fluid in the upper sublayer is varied to provide a range of property values, i.e., heptane over water and silicone oil over water are systems used. Dissert. Abstr.

N81-31502 Maryland Univ., College Park.
A HIGHER ORDER THEORY FOR THE POTENTIAL FLOW ABOUT THIN HYDROFOILS Ph.D. Thesis
Colen Guy Kennell 1980 93 p
Avail: Univ. Microfilms Order No. 8116494

The potential flow about a two dimensional hydrofoil moving with constant velocity at a fixed depth beneath a free surface (air-water interface) is investigated. The presence of the free surface adds kinematic and kinetic boundary conditions not found in the related airfoil problem. Disturbances generated by the hydrofoil propagate downstream along the free surface in the form of waves. A higher order method is developed that approximates body and free surface boundary conditions in a consistent manner for thin hydrofoils near the free surface. The thickness-to-chord ratio of the hydrofoil is assumed to be small and disturbances to the undisturbed stream are assumed to be small. Free surface and boundary conditions are transferred to the undisturbed free surface location and chord respectively using Taylor series expansions. Dependent variables are expanded in powers of a small expansion parameter. Dissert. Abstr.

N81-31503 Illinois Inst. of Tech., Chicago.
NONLINEAR FREE SURFACE CONVECTION IN A BOUNDED CYLINDRICAL GEOMETRY Ph.D. Thesis
Suresh Shyam Sunder Agrawal 1980 324 p
Avail: Univ. Microfilms Order No. 8112411

Free surface convection driven by buoyancy (Rayleigh convection) and surface tension gradients (Marangoni convection) are considered for a gas-liquid system. The geometry chosen is a bounded right circular cylinder with insulated rigid walls and with the bottom plate at a constant temperature. The onset of buoyancy driven convection and the velocity and temperature profiles at the onset are studied. The behavior of the system in the supercritical regime is also studied by solving the complete nonliner Rayleigh and Marangoni convection problems. Axisymmetric flow fields at high Prandtl numbers are studied.
Dissert. Abstr.

N81-31504 Rice Univ., Houston, Tex.
HEAT TRANSFER IN DEVELOPING LAMINAR PIPE FLOW: WITH OR WITHOUT A PHASE CHANGE MATERIAL AROUND THE PIPE Ph.D. Thesis
Soheil Asgarpour 1981 204 p
Avail: Univ. Microfilms Order No. 8116937

The heat transfer characteristics of a viscous, low Peclet number fluid entering a circular duct from an isothermal reservoir is considered. A technique for realistically modeling the constant temperature entrance condition in the presence of axial conduction is described. Graphs of the local Nusselt number and the local temperature profile are given for each case of constant temperature and constant heat flux at the duct wall. The energy equation is solved numerically using a finite difference scheme; Langhaar's solution for developing flow is used to describe the fluid dynamics. The results were tested by assuming either uniform or parabolic velocity profile. The results compared favorably with those reported in the literature. The classical Graetz problem was also solved, and the numerical result agreed to within 1 percent with the known analytical solution. Dissert. Abstr.

N81-31505 Johns Hopkins Univ., Baltimore, Md.
HYDRODYNAMIC STABILITY OF THIN FILMS Ph.D. Thesis
Malcolm Ballard Williams 1981 226 p
Avail: Univ. Microfilms Order No. 8115730

The nonlinear stability of thin films to finite amplitude disturbances is investigated. The dynamics of the thin film are formulated using the Navier-Stokes equations augmented by body forces describing London/van der Waals attractions and double-layer repulsion forces. The resulting nonlinear evolution equation is examined for the film thickness. An asymptotic limit of vanishing capillary number is used to obtain a 'large surface tension' approximation to the evolution equation. The simplified evolution equation (neglecting double-layer forces) is then solved numerically. The nonlinear evolution on the time to rupture and on the spatial structure of the developing layer is determined.
Dissert. Abstr.

N81-31506 Missouri Univ. -Columbia.
MASS, HEAT AND MOMENTUM TRANSFER TO A SPHERE IN A RAREFIED GAS Ph.D. Thesis
Kuo-Chyuan Lea 1980 114 p
Avail: Univ. Microfilms Order No. 8117451

Numerical solutions of the three transport problems: the condensation on a spherical droplet, the heat transfer from a sphere, and the frictional drag force on a spherical body are provided for all values of Knudsen numbers by considering the BGK model and diffuse reflection. For mass and energy fluxes and the drag, the numerical results show a close agreement with the experimental data and a 2% maximum difference from some previously reported variational results. In addition, results for the density, temperature, and velocity profiles around the particulate are provided. These latter results are of immediate interest in several aspects of aerosol mechanics. Dissert. Abstr.

N81-31507*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
EXACT FINITE ELEMENTS FOR CONDUCTION AND CONVECTION
Earl A. Thornton, Pramote Dechaumphai, and Kumar K. Tamma 1981 13 p refs Presented at the 2nd Intern. Conf. on Numerical Methods in Thermal Probl., Venice, 7-10 Jul. 1981
(Grant NsG-1321)
(NASA-CR-164723) Avail: NTIS HC A02/MF A01 CSCL 20D

An approach for developing exact one dimensional conduction-convection finite elements is presented. Exact interpolation functions are derived based on solutions to the governing differential equations by employing a nodeless parameter. Exact interpolation functions are presented for combined heat transfer in several solids of different shapes, and for combined heat transfer in a flow passage. Numerical results demonstrate that exact one dimensional elements offer advantages over elements based on approximate interpolation functions. Author

N81-31508*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL EXPERIMENTS IN HOMOGENEOUS TURBULENCE
Robert S. Rogallo Sep. 1981 94 p refs
(NASA-TM-81315) Avail: NTIS HC A05/MF A01 CSCL 20D

The direct simulation methods developed by Orszag and Patternson (1972) for isotropic turbulence were extended to homogeneous turbulence in an incompressible fluid subjected to uniform deformation or rotation. The results of simulations for irrotational strain (plane and axisymmetric), shear, rotation, and

relaxation toward isotropy following axisymmetric strain are compared with linear theory and experimental data. Emphasis is placed on the shear flow because of its importance and because of the availability of accurate and detailed experimental data. The computed results are used to assess the accuracy of two popular models used in the closure of the Reynolds-stress equations. Data from a variety of the computed fields and the details of the numerical methods used in the simulation are also presented. Author

N81-31509*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GORTLER VORTICES AND TRANSITION IN WALL BOUNDARY LAYERS OF TWO MACH 5 NOZZLES
Ivan E. Beckwith and Barbara B. Holley Aug. 1981 72 p refs
(NASA-TP-1869; L-14332) Avail: NTIS HC A04/MF A01 CSCL 20D

The onset of transition in the wall boundary layers of two axisymmetric Mach 5 wind-tunnel nozzles has been measured under conditions of extremely low incident disturbance levels. The range of test unit Reynolds numbers, based on conditions at the nozzle exit, was from 6 x 10 to the 6th power m to 2.5 x 10 to the 7th power m. When the nozzle walls were maintained in a polished and clean condition, transition moved gradually upstream as the test Reynolds number was increased. When transition occurred in the supersonic concave wall region, the values of the local Gortler parameter at transition varied from about 5 to 6, whereas the momentum thickness Reynolds number varied from about 750 to 1050. Oil flow patterns obtained near the exit of the nozzles indicated that Gortler vortices were always present when the wall boundary layers were laminar. Calculations for the growth of Gortler vortices based on new results from linear theory for supersonic flat-plate profiles gave amplification ratios to transition from e to the 4th power to e to the 15th power. Possible reasons for this wide range in amplification ratios are discussed, but no definite conclusions are yet possible regarding the values of n in a simple e to the nth power type theory for the assumed linear amplification of Gortler vortices to transition in supersonic nozzles. Author

N81-31510# California Univ., Berkeley. Dept. of Mechanical Engineering.
APPLICATIONS OF RAYLEIGH SCATTERING TO TURBULENT FLOWS WITH HEAT TRANSFER AND COMBUSTION Annual Report, 1 Mar. 1980 - 1 Mar. 1981
Lawrence Talbot and Frank Robben 30 Apr. 1981 10 p refs
(Contract F49620-80-C-0065; AF Proj. 2308)
(AD-A102176; AFOSR-81-0552TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

The instrumentation and data processing techniques to apply single channel Rayleigh scattering and laser Doppler anemometry to turbulent premixed combustion has been completed. The propagation of a flame in a grid-generated turbulent and in otherwise laminar flow containing a Karman vortex street generated by a rod have been investigated. Three reports describing this work have been completed and are in the process of publication. The ratio of turbulent length scale to laminar flame thickness and the turbulent intensity predict that the wrinkled laminar flame model should be valid for the physical structure of the turbulent flame. The results appear to be in agreement with this model. They also indicate: reduction of turbulent intensities behind the flame and no evidence of combustion generated turbulence, appreciable volume of intermediate states (partially burned gas) in the combustion zone, perturbation and increase of the upstream turbulence flame, interference of the rod flame-holder wake with the flame for small angles of the flame front to the flow, and apparent disappearance of rod-generated vortices behind the flame.
Author (GRA)

N81-31511# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF COHERENT STRUCTURE IN THE TURBULENT BOUNDARY LAYER Annual Scientific Report, 1 May 1980 - 30 Apr. 1981
D. E. Abbott, C. R. Smith, and J. D. A. Walker 30 Jun. 1981 24 p refs
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A102368; AFOSR-81-0605TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

This project combines both experimental video flow visualization studies and theoretical investigations of a series of phenomenological and theoretical models based upon the three dimensional details of convected, coherent structural elements of a turbulent flow as it interacts with a solid surface. The experimental program has considered a range of sub-problems including high Reynolds Number (4 million) turbulent flows, the effect of surface modification on low-speed streak formation, and the effect of vortex loop interaction with a solid boundary. To augment the visualization pictures, a computerized video-digitizing system has been implemented. Results show promise for obtaining quantitative data from low visualization pictures. The specific thrust of the theoretical studies has been focussed on three areas: how two and three dimensional vortex structures interact with wall boundary layers, the development of a new type of prediction method for two dimensional turbulent boundary-layer flows, and improvement in numerical techniques for solving parabolic, boundary-layer equations. Author (GRA)

N81-31512# Case Inst. of Tech., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
THE EFFECT OF BODY FORCES ON THE MOTION AND HEAT TRANSFER OF CONFINED FLUIDS Final Report, 1 Nov. 1978 - 31 Oct. 1980
Simon Ostrach 31 Dec. 1980 31 p refs
(Contract F49620-79-C-0033; AF Proj. 2307)
(AD-A102042; AFOSR-81-0580TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Various modes of flow have been delineated and the nature and extent of these under different conditions have been described. Emphasis has been on confined natural convection configurations. Although specific problems have been treated both experimentally and theoretically, the methods are not now available to predict general flow pattern for a given configuration. This is due to the inherent bidirectional coupling between the boundary layers and the core which is a basic feature of all confined flow problems. Other activity has centered on some new aspects of natural convection with imposed heat flows in more than one direction simultaneously and on the interaction of thermal and hydrodynamic instabilities. Author (GRA)

N81-31513# Case Inst. of Tech., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
PRELIMINARY EXPERIMENTAL STUDY OF DISTURBANCES IN A LAMINAR BOUNDARY-LAYER DUE TO DISTRIBUTED SURFACE ROUGHNESS Final Report
Leon Leventhal and Eli Reshotko May 1981 102 p refs
(Grant AF-AFOSR-3562-78; AF Proj. 2307)
(AD-A102072; AFOSR-81-0588TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

Mean flow and disturbance measurements have been made on a flat plate model, one meter long in the CWRU low speed wind tunnel using hot-wire anemometry. Tests were conducted on a smooth plate and with two different grades of sandpaper covering; first with a sandpaper covering giving Re sub K values centered around 10 and then with a coarser sandpaper have Re sub K values of about 150. The mean flow measurements indicated Blasius profiles for the smooth plate and with the finer roughness. With the coarser roughness the profile was best approximated by a Blasius profile at the early stations but then progressed toward a turbulent profile. GRA

N81-31514# Cranfield Inst. of Tech., Bedfordshire (England). School of Mechanical Engineering.
UNSTEADY EFFECTS OF CIRCUMFERENTIAL PRESSURE DISTORTED INLET FLOWS IN COMPRESSORS Final Report, 1978 - 1981
R. E. Peacock Jun. 1981 152 p refs
(Grant AF-AFOSR-3305-77; AF Proj. 2307)
(AD-A102330; AFOSR-81-0604TR) Avail: NTIS HC A08/MF A01 CSCL 13/7

An investigation of the mechanics of rotor unsteady response in the presence of both upstream generated planar distortion and rotating stall is described. To this end, a system for the

measurement and analysis of on-rotor pressure data was developed on a single stage, low speed rig. Two areas of investigation based on the compressor operating conditions were pursued: operation on the negative slope of the characteristic (nominally stable flow) and on the positive and zero slope (rotating stall). Compressor overall performance and detailed response followed trends anticipated by the blockage effects of the inlet disposed screens. Two classes of rotating stall were isolated, each with different characteristics. One was present under low flow uniform inlet conditions and the other when an inlet distortion was present. Author (GRA)

N81-31515# Aeronautical Research Associates of Princeton, Inc., N. J.

STATISTICAL CONSTRAINTS ON SCALAR VARIABLES IN TURBULENT FLOWS Scientific Report, 1 Jan. - 31 Jul. 1978

Guido Sandri, Peter J. Mansfield, Ashok K. Varma, and Coleman duP. Donaldson Feb. 1981 105 p

(Contract F44620-76-C-0048; AF Proj. 2307)

(AD-A102342; ARAP-346; AFOSR-81-0593TR) Avail: NTIS HC A06/MF A01 CSCL 20/4

We consider the statistical behavior of scalar variables in turbulent flows. The presence of chemical reactions requires statistical models for third and higher moments in order to close the rate equations. A realistic analysis should not be restricted to small fluctuations. The results presented here are completely free from such restrictions. The essential points to be demonstrated are: (1) Given A-bar and A-squared-bar, we can obtain stringent statistical bounds on a-squared B1)-bar and related moments. These bounds are found to be of interest in discussing recent experiments. (2)Maximum and minimum third (and higher) moments can be reached only with Dirac functions (i.e., discrete distributions). (3)We can always realize a statistically acceptable choice of A-bar and A-squared bar with a few Dirac functions (the minimum number is two distinct ones). The statements given above hold true when several moments (rather than only A-bar and A1-squared-bar) are given as well as when the means of several variables are given. As one consequence, we shall see that we can find, for the purposes of modeling, a discrete distribution that represents the desired set of moments and that is statistically legitimate for all allowed values of the derived moments (box model). Author (GRA)

N81-31516# Aeronautical Research Labs., Melbourne (Australia).

TURBULENT BOUNDARY LAYER FLOW THROUGH A GAP IN A WALL-MOUNTED ROUGHNESS ELEMENT

W. H. Schofield, D. S. Barber (U.S. Army Corps, West Point), and E. Logan (Arizona State Univ.) Sep. 1980 27 p refs

(AD-A102324; ARL/MECH-ENG-NOTE-384; AR-002-232) Avail: NTIS HC A03/MF A01 CSCL 20/4

The development of a turbulent boundary layer flow through a gap in an isolated wall-mounted roughness element has been studied experimentally. Two flow regions were distinguished downstream of the gap; a distortion region followed by a readjustment region. In the distortion region, two counteracting distortion mechanisms were identified, the relative importance of which depended on gap size. Thus flows downstream of large gaps were found to differ significantly from those through small gaps. After distortion the layer readjusts itself and approaches equilibrium conditions of an undisturbed zero pressure gradient layer. The readjustment starts near the wall with the turbulence adjustment preceding the mean flow adjustment. The growth of the internal layer for flow through six different gap sizes can be described by a single function if internal layer height and distance from the gap are non-dimensionalized with the local wall length scale. Well downstream of the gap it is shown that all six flows are similar and are approaching equilibrium conditions in a similar manner. Author (GRA)

N81-31517# California Univ., Livermore. Lawrence Livermore Lab.

SIMULATION OF THREE-DIMENSIONAL, TIME-DEPENDENT, INCOMPRESSIBLE FLOWS BY A FINITE ELEMENT METHOD

Stevens T. Chan, Philip M. Gresho, Robert L. Lee, and Craig D. Upson 1981 10 p refs Presented at the 5th AIAA Computational Fluid Dyn. Conf., Palo Alto, Calif., 22-23 Jun. 1981

(Contract W-7405-eng-48)

(UCRL-85226; CONF-810664-1) Avail: NTIS HC A02/MF A01

A finite element model for simulating the dynamics of problems encountered in atmospheric pollution and safety assessment studies is described. The model is based on solving the set of three dimensional, time dependent, conservation equations governing incompressible flows. Spatial discretization is performed via a modified Galerkin finite element method, and time integration is carried out via the forward Euler method (pressure is computed implicity, however). Several cost-effective techniques (including subcycling, mass lumping, and reduced Gauss-Legendre quadrature) which have been implemented are discussed. Numerical results are presented to demonstrate the applicability of the model. DOE

N81-31518# Tennessee Univ. Space Inst., Tullahoma. Energy Conversion Div.

DEVELOPMENT AND HEAT TRANSFER ANALYSIS OF DIRECT COAL FIRED MHD COMBUSTORS

G. D. Roy and R. C. Attig Jun. 1981 71 p refs

(Contract DE-AC02-79ET-10815)

(DOE/ET-10815/T4) Avail: NTIS HC A04/MF A01

The performance of the generator as a function of the combustor geometry and other factors (MHD combustor/generator interaction); knowledge of the heat flux distribution and the heat losses of various locations were studied. The heat loss in the coal combustor increases the cost of electricity and should thus be kept at a minimum. For higher conductivities, the thermal energy of the coal should be relesed as completely as possible. Since the resulting performance of the generator is the best criterion of combustor selection, detailed combustor/generator interaction testing was undertaken. Heat transfer was used as one diagnostic tool among others. Details of this testing and data analysis are presented. T.M.

N81-31519# Rensselaer Polytechnic Inst., Troy, N. Y. Energy Systems Group.

ANALYTICAL MODELS FOR SIMULTANEOUS HEAT AND MOISTURE TRANSPORT IN SOILS

Alan G. Gibbs (Pacific Northwest Lab.) and Robert G. Baca Apr. 1981 65 p refs

(Contract DE-AC06-77RL-01030)

(RHO-LD-49) Avail: NTIS HC A04/MF A01

Basic equations are derived to describe the transport of heat and moisture in soils, in response to gravity, capillarity, and temperature gradients. Appropriate boundary conditions are given for cases where surface evaporation is limited by atmospheric conditions or by diffusion rates in the soil. Some approximate techniques which lead to linear equations are described. Analytical solutions are derived for four linear models. Numerical evaluation of the analytical solutions, using the program MOIST, is described, and the results are compared to those generated by a finite element solution technique applied to the governing equations. Analytical and numerical results showed excellent agreement. DOE

N81-31520# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

SCIENTIFIC REPORT OF THE RESEARCH DEPARTMENT FOR FLUID DYNAMICS Status Report, 1980 [FORSCHUNGSBEREICH STROEMUNGSMECHANIK, WISSENSCHAFTLICHER BERICHT - STAND 1980]

1980 105 p refs In GERMAN Original contains color illustrations

Avail: NTIS HC A06/MF A01

Activities in theoretical fluid mechanics with contributions on transonic and supersonic flows, boundary layers, and separated flows, are described. Research in experimental fluid mechanics, principally dealing with boundary layers, flow acoustics, separated flows, aerodynamics of airfoils and of air and spacecraft configurations, diagnostics, and development of research facilities was performed. Turbomachinery, including aerodynamics and combustion phenomena, and acoustics (with emphasis on propeller noise, airframe noise and noise certification) were studied. Design aerodynamics, with computational modelling of flow fields

around planes, road vehicles and turbine blades is discussed.
Author (ESA)

N81-31521# Karlsruhe Univ. (West Germany). Ausbreitungs- und Transportvorgaene in Stroemungen.
RESEARCH PROGRAM OF THE SPECIAL RESEARCH DIVISION 80, 1981 TO 1983 [FORSCHUNGSPROGRAMM DES SONDERFORSCHUNGSBEREICHS 80 FUER DIE JAHRE 1981-1983]
M. Schatzmann and Herausgeber Mar. 1980 343 p refs In GERMAN Sponsored by Deutsche Forschungsgemeinschaft
(KU-SFB-80/A/166) Avail: NTIS HC A15/MF A01

Turbulent propagation phenomena in flows with numerical simulations on atmospheric boundary layers, dispersion flows, open channel flows, cooling tower plumes, and stratified flows were studied. Flows with wall reactions, with particular emphasis on biochemical slimes, analytical impacts of chemical compounds, and sedimentation, were examined. Work on propagation and transport in dam reservoirs, with experimental investigations of mass exchange in density wedged flows, aeration and transverse mixing in natural channels is reported. Ground water studies, with simulation of saturated-unsaturated seepage and measurements on exchange between surface and ground water were performed as well as turbulent flow diagnostics, with developments of a laser Doppler anemometer for two phase flows and dispersion flow instrumentation. Author (ESA)

N81-31522# National Maritime Inst., Teddington (England).
WAVE FORCES ON CYLINDERS AND SPHERES IN THE DIFFRACTION REGIME
J. R. Richardson Jan. 1980 12 p refs Sponsored by Dept. of Energy's Offshore Energy Technology Board
(NMI-R-71; OT-R-8004) Avail: NTIS HC A02/MF A01

Simple theorems are derived for the wave forces on immersed cylinders and spheres. These forces are shown to be dependent only upon the undisturbed wave particle acceleration at the center of the body and are thus independent of the ratio of diameter to wave length. The cylinder results apply to two dimensional flow. Author (ESA)

N81-31523# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
A CALCULATION METHOD FOR THE VISCOUS FLOW AROUND MULTI-COMPONENT AIRFOILS
B. Oskam 20 Sep. 1980 135 p refs
(Contract NIVR-1738)
(NLR-TR-79097-U) Avail: NTIS HC A07/MF A01

Viscous flow was calculated by solving incompressible potential flow and boundary layer problems iteratively. The potential flow problem is solved by a revised version of the two dimensional NLR panel method. A model transport equation of turbulent stress is employed to calculate the turbulent boundary layer. The inviscid/viscous interaction near the trailing edge is treated by matching at the edge of the boundary layer. A treatment of laminar separation bubbles is included. The resultant predictions of the viscous flow agree reasonably well with experimental data, provided no extensive flow separation and/or wake flows in adverse pressure gradient are present. Author (ESA)

N81-31524# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
BOUNDARY LAYERS WITH STRONG INTERACTION: FROM ASYMPTOTIC THEORY TO CALCULATION METHOD
A. E. P. Veldman 14 Apr. 1980 18 p refs Presented at BAIL 1 Conf. on Boundary and Interior Layers - Computation and Asymptotic Methods, Dublin, 3-6 Jun. 1980
(NLR-MP-80015-U) Avail: NTIS HC A02/MF A01

A quasi-simultaneous method is described to calculate laminar, incompressible boundary layers interacting with an inviscid external flow. An interactive boundary condition prescribing a linear combination of pressure and displacement thickness, which models the behavior of the external flow is used. The method avoids difficulties incurred when either direct or inverse methods are used, resulting in fast convergence of the iterative procedure involved. The design of the method was guided by the properties of the triple-deck, which asymptotically, in the limit of vanishing viscosity, can describe interacting boundary layers. Of special importance is the lack of hierarchy between the viscous and inviscid parts of the triple-deck; a situation which is termed strong interaction. The quasi-simultaneous method is demonstrated by means of two types of strongly interacting boundary layers: separated boundary layers, and trailing edge flow. In the latter case a comparison with results from asymptotic theory can be made. Author (ESA)

N81-31525# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
THE CALCULATION OF INCOMPRESSIBLE BOUNDARY LAYERS WITH STRONG VISCOUS-INVISCID INTERACTION
A. E. P. Veldman 6 Aug. 1980 15 p refs Presented at AGARD Symp. on Computation of Viscous-Inviscid Interaction, Colorado Springs, Colo., 29 Sep. - 1 Oct. 1980
(Contract NIVR-1865)
(NLR-MP-80032-U) Copyright. Avail: NTIS HC A02/MF A01

A quasi-simultaneous method is described to calculate laminar, incompressible boundary layers interacting with an inviscid external flow. The numerical treatment of the interactive boundary condition which models the behavior of the outer flow is described. It is regarded as a relation between the pressure and the displacement thickness where both quantities are simultaneously treated as unknowns. The method avoids difficulties incurred when either direct or inverse methods are used, resulting in fast convergence of the iterative procedure involved. The numerical strategy can be regarded as a recognition of the lack of the hierarchy of the triple deck which asymptotically can describe interacting boundary layers. The term strong interactions refers to situations without a definite hierarchy between the viscous and inviscid regions. The success of the quasi-simultaneous method is explained from a purely numerical point of view.
Author (ESA)

N81-31526# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
COMPUTATION ASPECTS AND RESULTS OF LOW-SPEED VISCOUS FLOW ABOUT MULTICOMPONENT AIRFOILS
B. Oskam 22 Aug. 1980 17 p refs Presented at AGARD Symp. on Computation of Viscous-Inviscid Interactions, Colorado Springs, Colo., 29 Sep. - 1 Oct. 1980
(Contract NIVR-1738)
(NLR-MP-80034-U) Avail: NTIS HC A02/MF A01

The viscous flow about multicomponent airfoils was calculated solving incompressible potential flow and boundary layer problems iteratively. The presence of the shear layers is modeled in the potential flow by an outflow boundary condition on the airfoil surface and the wake centerline. Solutions show that high accuracy of the potential flow solution is required to justify the correction for viscous effects, especially near the wing trailing edge of a slotted configuration. Leading edge stall was studied. Turbulent boundary layer separation at 3% chord downstream of a laminar separation bubble is found on the nose of a NACA 63-009 airfoil at high Reynolds number indicating the occurence of turbulent leading edge stall. This phenomenon, being difficult to distinguish from laminar leading edge (short bubble) stall, occurs at such a small scale that it is observed only with high resolution results. The importance of the wing wake of a slotted configuration is examined. Author (ESA)

N81-31146*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REPORT OF THE PANEL ON FLUID DYNAMICS
Percy J. Bobbitt *In its* High Reynolds Number Res. - 1980 Sep. 1981 p 169-195 refs (For primary document see N81-31130 22-02)
Avail: NTIS HC A14/MF A01 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N81-31527 Arizona Univ., Tucson.
THE FOUR-MODE LINEARLY-POLARIZED RING LASER GYRO Ph.D. Thesis
Dana Zachary Anderson 1981 125 p
Avail: Univ. Microfilms Order No. 8116816

Two mode ring lasers used as rotation rate sensors are plagued by the phenomenon known as frequency locking whereby output information about the input rate ceases to become available at low input rotation rates. It was observed that under certain circumstances the four mode linearly polarized ring laser does not exhibit locking behavior. Instead, a reciprocal bias appears that is one which is constant in magnitude but changes sign with a change in direction of the input rate. After a review of ideal and real two mode ring laser characteristics, the four mode ring laser is discussed from both experimental and theoretical standpoints. In particular, the nature of the reciprocal bias is established, and the relative merits of the four mode ring laser as a replacement for the two mode laser are brought to light. It is concluded that four mode operation of a ring laser offers many prospective advantages including those associated with plasma current and cavity length control as well as the elimination of the frequency locking problem. Dissert. Abstr.

N81-31528*# Raytheon Co., Sudbury, Mass. Equipment Div.
HIGH RESOLUTION ANGULAR SENSOR Final Report
Morris I. Gneses and Dennis S. Berg Jun. 1981 108 p refs
(Contract NAS8-31840)
(NASA-CR-161843; ER81-4177) Avail: NTIS HC A06/MF A01 CSCL 14B

Specifications for the pointing stabilization system of the large space telescope were used in an investigation of the feasibility of reducing ring laser gyro output quantization to the sub-arc-second level by the use of phase locked loops and associated electronics. Systems analysis procedures are discussed and a multioscillator laser gyro model is presented along with data on the oscillator noise. It is shown that a second order closed loop can meet the measurement noise requirements when the loop gain and time constant of the loop filter are appropriately chosen. The preliminary electrical design is discussed from the standpoint of circuit tradeoff considerations. Analog, digital, and hybrid designs are given and their applicability to the high resolution sensor is examined. the electrical design choice of a system configuration is detailed. The design and operation of the various modules is considered and system block diagrams are included. Phase 1 and 2 test results using the multioscillator laser gyro are included. A.R.H.

N81-31529*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN INSTRUMENT FOR DETERMINING COINCIDENCE AND ELAPSE TIME BETWEEN INDEPENDENT SOURCES OF RANDOM SEQUENTIAL EVENTS Patent Application
James I. Clemmons, Jr., inventor (to NASA) Filed 10 Jul. 1981 16 p
(NASA-Case-LAR-12531-1; US-Patent-Appl-SN-282191) Avail: NTIS HC A02/MF A01 CSCL 14B

An instrument for use in laser velocimetry is described. The instrument receives pulses from a primary external source and one or more secondary external sources and determines when there is coincidence between the primary and one of the secondary sources. The instrument generates a finite time window (coincidence aperture) during which coincidence is defined to have occurred. The time intervals between coincidence apertures in which coincidences occur are measured. NASA

N81-31530# Coe Associates, Mountain View, Calif.
DEFECT CHARACTERIZATION BY ACOUSTIC HOLOGRAPHY. VOLUME 2: EFFECTS OF CLADDING ON AH IMAGING AND TEST-BLOCK RESULTS Final Report
A. Holt and J. Brophy May 1981 122 p refs Prepared jointly with Babcock and Wilcox Co., Lynchburg, Va.
(EPRI-NP-1534-Vol-2) Avail: NTIS HC A06/MF A01

The results obtained during 17 different inspections of a specially prepared, partly clad test block are presented and compared with destructive test results. Summary data drawn from the report prepared by the 11 investigative teams are presented as well as the conclusions and recommendations of the principal investigators. GRA

N81-31531# Bendix Corp., Kansas City, Mo.
TESTER LINE VOLTAGE MONITOR Final Report
G. A. Millican Jun. 1981 60 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2449) Avail: NTIS HC A14/MF A01

A line voltage monitor system for detecting voltage transients, power sags, and power surges is described and its performance evaluated. A circuit diagram is presented. The analog circuit cards can be used alone or with a microprocessor to control a time clock and memory storage of occurences. DOE

N81-31532# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev. Energy Measurements Group.
OSCILLATOR MONITOR
George A. McNeill 1 Jul. 1981 19 p refs
(Contract DE-AC08-76NV-01183)
(EGG-1183-1802) Avail: NTIS HC A02/MF A01

Present high speed data acquisition systems in nuclear diagnostics use high frequency oscillators to provide timing references for signals recorded on fast, traveling wave oscilloscopes. An oscillator's sinusoidal wave shape is superimposed on the recorded signal with each cycle representing a fixed time increment. During data analysis the sinusoid is stripped from the signal, leaving a clean signal shape with known timing. Since all signal/time relationships are totally dependent upon working oscillators, these critical devices must have remote verification of proper operation. This manual presents the newly developed oscillation monitor which will provide the required verification. DOE

N81-31122*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATIONS OF DYNAMIC STABILITY PARAMETERS TO PROBLEMS IN AIRCRAFT DYNAMICS
Joseph R. Chambers, Daniel J. DiCarlo, and Joseph L. Johnson, Jr. *In* AGARD Dyn. Stability Parameters May 1981 12 p refs (For primary document see N81-31105 22-01)
Avail: NTIS HC A17/MF A01 CSCL 01C

36 LASERS AND MASERS

Includes parametric amplifiers.

N81-31533 Rice Univ., Houston, Tex.
ELECTRON BEAM PUMPED TUNABLE EXCIMER LASERS Ph.D. Thesis
Michael C. Smayling 1981 180 p
Avail: Univ. Microfilms Order No. 8116996

Laser characteristics of the broadband rare gas halide Xe2Ce, Kr2F, and XeF (C yields A) were investigated. Since all three excimers have unbound ground states, a spectrally wide emission bandwidth is available for wavelength tuning. Other excimers with wide band fluorescence emissions were studied but had gains too small to achieve laser threshold in a 10 cm transversely pumped laser cavity. Mixture optimization, variation of optical resonator configuration, and influence of different halogen donors and buffer gases were studied. Tuning was accomplished by using cavity mirrors with different center wavelengths. The trimer Xe2Cp had a nominal peak wavelength of 518 nm. Laser pulse widths were about 36 nsec, and were delayed by 35 nsec from the e-beam excitation current pulse. This delay was observed in the other lasers as well, and can be attributed to transient absorption by molecular argon. Atomic absorptions by xenon metastables to Rydberg levels were identified in the laser spectrum.

The kinetics of Xe2Cl were also studied. The triatomic excimer Kr2F lased at 436 nm. The pulse duration was approximately XeF(C yields A) had the largest laser output intensity. The peak wavelength was 486 nm, with tuning range f 30 nm. Pulse duration was approximately 30 nsec. Xenon absorption lines were identified which belonged to the same series as observed for the Xe2Cl laser. Dissert. Abstr.

N81-31534 Wayne State Univ., Detroit, Mich.
MEASUREMENTS OF THE CO LASER CHARACTERISTICS BY MEDIUM MODULATION Ph.D. Thesis
Sung-Won Kim 1981 174 p
Avail: Univ. Microfilms Order No. 8117075

The effects on the vibrational population caused by modulated lasing were studied in an electrical discharge CO-N2-He laser plasma cooled with liquid nitrogen. Direct observations on vibration electronic energy exchange processes between diatomic molecules and on plasma impedance perturbations in the CO laser system are described. The measurements were obtained using a laser configuration with a low speed mechanical chopper introduced into the laser cavity. The laser medium was modulated between laser on and laser off conditions. The perturbation in the vibrational population produced by lasing showed that vibration electronic energy transfer can be another relaxation channel for vibrational energy in a discharge of excited CO molecules. An observed change in plasma impedance induced by laser modulation is proposed to be primarily due to ionization by highly vibrationally excited CO molecules. Dissert. Abstr.

N81-31535 Michigan State Univ., East Lansing.
A THEORETICAL AND EXPERIMENTAL EXAMINATION OF PULSED 16 MUm CO2 TRANSFER CHEMICAL LASERS Ph.D. Thesis
Warren Kendrick Jaul 1981 174 p
Avail: Univ. Microfilms Order No. 8117243

A pulsed hydrogen halide chemical laser was employed to optically pump a cell containing a mixture of HX, CO2, and diluent. Similar experiments using deuterium instead of hydrogen were performed. A computer model simulating laser oscillation in a DF/CO2 and HBr/CO2 device was developed and modified to simulate the absorption of the optical input pulse. Kinetic mechanisms important to 16 micron lasing were identified using the results of the computer simulation. The results of the computer calculations were compared to the experimental observations of R. M. Osgood and of N. Barnes. The model correctly predicted that increasing the partial pressure of Ar raised 16 micron pulse power while lowering pulse energy. Experiments using an HF laser to optically pump an HV/CO2/He gas mixture are described. No evidence of laser output from the device was observed. To attempt to explain these results, the computer model was modified to simulate the chemical kinetics in an HF/CO2 gas mixture. Dissert. Abstr.

N81-31536 Rice Univ., Houston, Tex.
COLOR CENTER LASERS FOR INFRARED SPECTROSCOPY Ph.D. Thesis
Clifford Raymond Pollock 1981 145 p
Avail: Univ. Microfilms Order No. 8116987

Two color center laser spectrometers were developed using an FA(II)and FB(II) color center laser system for the 2.2-3.3 um region, and a powerful single mode F2+ color center ring laser for the 0.82-1.05 um region. Both lasers are interfaced to a minicomputer to provide long range scanning, high resolution data acquisition, and automatic calibration. An extensive set of software algorithms and a stable hardware interface between the laser and computer are necessary to reliably control and calibrate the lasers. The method, described as magnetic rotation spectroscopy, uses the Faraday effect to modulate the polarization of a beam travelling through a paramagnetic specie. A1 F2- color center was built in a ring configuration to obtain maximum single mode output power. Design criteria for the laser resonator, the optical which forces unidirectional operation of the laser, and the tuning system have been developed to prolong the lifetime of the F2- crystal, and to insure stable and unidirectional single mode operation. Dissert. Abstr.

N81-31537*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
STUDY OF THE DISSOCIATION OF MOLECULAR HYDROGEN Final Report, 2 Jan. 1980 - 30 Apr. 1981
Robert F. C. Vessot Jul. 1981 12 p
(Contract NAS8-33521)
(NASA-CR-161844) Avail: NTIS HC A02/MF A01 CSCL 20E

Dissociators used to obtain an RF plasma discharge for hydrogen masers and the test system used for operation and evaluation of the dissociators are described. A compact sorption cartridge using a graphite matrix is tested as part of a hydrogen scavenging system. Testing of a vacuum enclosed hydrogen dissociator suitable for long term operation in space is described. J.D.H.

N81-31538# Naval Surface Weapons Center, White Oak, Md.
BANDWIDTH AND FREQUENCY ENHANCEMENT OF FREE ELECTRON LASER IN A MILDLY RELATIVISTIC ELECTRON BEAM Final Report
Han S. Uhm Apr. 1981 18 p refs
(AD-A102164; NSWC/TR-81-103) Avail: NTIS HC A02/MF A01 CSCL 20/5

The bandwidth and frequency enhancement of the free electron laser instability in a mildly relativistic (gamma approximately less than 1.15) electron beam propagating through a dielectric loaded waveguide is presented. For an appropriate choice of the dielectric constant epsilon and the thickness of the dielectric material, it is shown that the instability bandwidth and frequency can be greatly enhanced for specified values of the beam energy and the wiggler wavelength. Author (GRA)

N81-31539# Rochester Univ., N. Y. Lab. for Laser Energetics.
DEVELOPMENT OF X-RAY LASER MEDIA: MEASUREMENT OF GAIN AND DEVELOPMENT OF CAVITY RESONATORS FOR WAVELENGTHS NEAR 130 ANGSTROMS Final Technical Report, 1 Nov. 1976 - 31 Dec. 1980
James M. Forsyth Jul. 1981 69 p refs
(Grant AF-AFOSR-3189-77; AF Proj. 2301)
(AD-A102335; AFOSR-81-0613TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

A new experimental facility was used to explore a range of conditions under which inverted populations on soft X-ray transitions could be produced in laser heated plasmas. Direct measurements with grating spectrographs were performed in the vicinity of 130 A to develop the diagnostic techniques for gain determination. Designs for reflectors suitable for use in cavity resonators at soft X-ray wavelengths were developed. Construction of apparatus to produce such reflectors was begun. A patent on the reflector design was applied for. Author (GRA)

N81-31540# Polytechnic Inst. of New York, Farmingdale. Microwave Reseach Inst.
UNSTABLE RESONATORS Final Report
L. B. Felsen May 1981 51 p refs
(Grant AF-AFOSR-3192-77; AF Proj. 2301)
(AD-A102071; POLY-MRI-1414-81; AFOSR-81-0568TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report summarizes accomplishments pertaining to two new methods for analyzing unstable resonators: (1) a waveguide method, and (2) a ray-optical method. The waveguide method has been found effective for calculating eigenvalues, but not eigenmodes, in symmetric configurations with sharp-edged or round-edged mirrors, and with misaligned mirrors. The ray-optical method has been found effective not only for these same configurations but also for nonsymmetric structures containing internal axicons. Moreover, it yields the eigenvalues as well as the eigenmode fields. Therefore, the ray method promises to provide a useful tool for studying features introduced by successive complication of the resonator model. Author (GRA)

N81-31541# Columbia Univ., New York. Dept. of Electrical Engineering and Computer Science.
HIGH POWER SUBMILLIMETER AND INFRARED RADIATION FROM INTENSE RELATIVISTIC ELECTRON BEAMS Interim Scientific Report, 1 Jan. - 31 Dec. 1980
S. P. Schlesinger, T. C. Marshall, and P. Diament 1981 10 p refs
(Grant AF-AFOSR-0118-80; AF Proj. 2301)

(AD-A102487; AFOSR-81-0570TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

The first quarter of Calendar year 1980 was spent installing and testing the newly acquired long-pulse well-regulated Physics International Pulserad 220 unit (1 Mev. 20 KA 100 nsec). The balance of the year was spent on the first phase of the FEL long pulse oscillator experiment and the beginnings of an investigation of the FEL amplifier. Wavelength and power were measured as a function of electron energy and current. Theoretical work included an exact analysis of particle dynamics in a true wiggler and the formulation of a simulation of a pump oscillated test particle in a plasma background, the latter study yielding new insights into finite Larmor radius effects. Author (GRA)

N81-31542# California Univ., Livermore. Lawrence Livermore Lab.

PULSED-LASER HEATING: A TOOL FOR STUDYING DEGRADATION OF MATERIALS SUBJECTED TO REPEATED HIGH TEMPERATURE EXCURSIONS

A. Goldberg and R. H. Cornell 21 Aug. 1980 48 p refs (Contract W-7405-eng-48)

(UCRL-53074; ARO-15812-MS) Avail: NTIS HC A03/MF A01

The use of pulsed laser heating was evaluated as a means to obtain high cyclic peak temperatures with short rise times. A two stage neodymium glass laser was used which produces a 600 microns pulse with energy outputs of up to 100 J. Small disk shaped samples of AISI 4340 steel served as targets. Some of these were coated with a tungsten deposit. The rear face of some of the targets was instrumented for evaluation of temperature, strain, and stress response. Post shot metallographic evaluations were made on a number of targets. Evidence of surface melting, cracking, and phase transformation was observed. Surface damage was related to differences in the number of pulse cycles and input energy level, variables in the target materials, and the extent of strain induced stresses. These experiments were performed in air at 1 atm and ambient laboratory temperature. DOE

N81-31543# Max-Planck-Gessellschaft, Garching (West Germany). Projektgruppe fuer Laserforschung.

TIME RESOLVED UV-SPECTROSCOPY OF NH3 MOLECULES VIBRATIONALLY EXCITED BY CO2 LASER RADIATION [ZEITAUFGELOESTE UV-SPEKTROSKOPIE AN DURCH CO2-LASERSTRAHLUNG SCHWINGUNGSANGEREGTEM NH3]

H. Holbach 1980 126 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie and Euratom

(PLF-31) Avail: NTIS HC A07/MF A01

The excitation of ammonia by a pulsed CO2 laser is investigated with emphasis on processes associated with collisions with argon. The previously reported multiphoton dissociation of NH3 under collisionless conditions; and the excitation mechanisms of nonresonant low vibrational levels were clarified to allow an appropriate selection of laser lines. A repertory was made of all vibrational rotational levels up to a distance of 20 cm from the laser line, complemented by line width and absorption coefficient calculations. Experimental setup, laser, data processing, and gas mixing installation are described. Time resolution of 5 to 10 ns is found to be sufficient for observing relational relaxation within individual vibrational levels. Step-by-step dissociation of NH3 is shown to be very improbable. NH3-Ar collisions are shown to be responsible for conversion of rotational into vibrational energy, a process hitherto not observed in a polyatomic molecule. Author (ESA)

N81-31544# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.

JOINT EUROPEAN TORUS (JET) DESIGN STUDY 8.3: QUASI-CONTINUOUS LASER SCATTERING. PART 2: EXTENSION TO SPATIAL SCAN

K. Hirsch, H. Salzman, H. Roehr (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany), and K.-H. Steuer (Max-Planck Inst. fuer Plasmaphysik, Garching, West Germany) Jan. 1981 39 p refs

(IPF-81-3-Pt-2) Avail: NTIS HC A03/MF A01

The use of several lasers in parallel for measuring electron density and temperature in a 90 deg scattering experiment is discussed. The lasers are synchronized with an accuracy better than the gating time of the detection system, and the beams combined by mirrors to form an array of parallel beams. The optical path of the laser beam traverses the torus vessel twice. Fiber optics of high purity fused quartz transmit the collected light to the detector system outside the torus hall. The ratio of Raman to Rayleigh cross section for hydrogen and deuterium was measured in a scattering cell near atmospheric pressure using an argon ion laser. A 13 J, 20 ns laser beam was passed through a plasma in ASDEX, and the results compared with the parameters of the scattering experiment on jet. Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N81-31545 British Library Lending Div., Boston Spa (England).

SAFETY LOCKING DEVICE BETWEEN SEALED VESSELS

Leto Fedi, Jean Meunier, and Jean Vertut 1 Jul. 1980 17 p Transl. into ENGLISH of French Patent No. 2-040-616 (11 Jan. 1971)

(BLL-RISLEY-4270-(9091.9F)) Avail: British Library Lending Division, Boston Spa, England

A safety device designed to interlock the two entrances of two water tight vessels, each connecting to the other by a flange and a door, with an opening of the same diameter is disclosed. The doors can only be opened when the two flanges have made contact and the doors are locked back to back, thus creating a passage between the two vessels. One of these could be a manipulation cell or cave for handling dangerous materials, for example those associated with nuclear installations, while the other could be a transfer vessel or any water tight receptable able to be attached to the first one. J.M.S.

N81-31546 Materials Research Labs., Ascot Vale (Australia).

MODELLING PENETRATION BY SLENDER HIGH KINETIC ENERGY PROJECTILES

R. L. Woodward Apr. 1981 34 p refs

(MRL-R-811; AR-002-409) Copyright. Avail: Issuing Activity

A model for the quantitative description of penetration by slender, high kinetic energy projectiles is presented and its usefulness assessed by comparison of computations with experimental data. The influence on behavior of projectile shape and erosion effects is discussed and a parametric study is performed to indicate the strong influence of penetrator and target density and of target strength on depth of penetration into semi-infinite metal targets. Author

N81-31547 Ohio State Univ., Columbus.

A THEORETICAL AND EXPERIMENTAL STUDY OF THE STATIC AND DYNAMIC BEHAVIOR OF VANE-TYPE PRESSURE COMPENSATED HYDRAULIC PUMPS WITH PROPORTIONAL-TYPE REGULATOR Ph.D. Thesis

Lutz Carlos Felicio 1981 342 p

Avail: Univ. Microfilms Order No. 8115104

Vane-type pumps with simple mechanical spring compensators are considered. A theoretical method of predicting the pump displacement per revolution and the pressure force on the cam ring is presented for pressure compensated vane pumps. A theoretical nonlinear dynamic model for pressure compensated vane pumps of the proportional control type was obtained from the ring motion and flow rate dynamic equations. Required relationships between the model coefficients for a stable feedback system were found based on a Routh criterion analysis of an approximate linear model. Steady-state error due to flow disturbances was also analyzed. A nonlinear dynamic model for a pressure-compensated vane pump of the integral control type is also presented. The response of the nonlinear model for the pump of the proportional control type was verified using digital simulation. Numerical values for the coefficients of the simulated model were found experimentally. Dissert. Abstr.

N81-31548 Florida Univ., Gainesville.

THE ANALYSIS AND DESIGN OF SHOCK ABSORBERS

WITH CONSTANT DECELERATION FOR VARIABLE LOADING Ph.D. Thesis
John Nelson Seaman 1980 52 p
Avail: Univ. Microfilms Order No. 8115675

For a given impact velocity of a vehicle striking a fixed surface, a spring damped shock absorber is developed to provide the same maximum deceleration of the vehicle irrespective of the loading at impact. The spring, damping and external forces are generalized (linear or nonlinear) in the initial part of the analysis. For a shock absorber with maximum efficiency, the maximum vehicle deceleration is shown to be a function of only the impact velocity and the cushion length. The sum of the spring, damping and external forces is found to be a constant which is a function of the vehicle weight. To illustrate the method of design analysis, a shock absorber using quadratic law damping and linear parallel spring is analyzed for a number of design case examples of horizontal and vertical vehicle motion at impact. Orifice area equations are developed, and dimensionless plots versus cushion length and closure time are presented. An automatic orifice area regulator is then designed to provide optimum shock absorber response for all loading conditions of a freight car at impact. Dissert. Abstr.

N81-31549*# SKF Industries, Inc., King of Prussia, Pa.
DEVELOPMENT OF SMALL BORE, HIGH SPEED TAPERED ROLLER BEARING Final Report, May 1978 - Jun. 1981
F. R. Morrison, S. S. Gassel, and R. L. Bovenkerk Jun. 1981 280 p refs
(Contract NAS3-20839)
(NASA-CR-165375; SKF-AT81T014) Avail: NTIS HC A13/MF A01 CSCL 13I

The performance of four rolling bearing configurations for use on the input pinion shaft of a proposed commercial helicopter transmission was evaluated. The performance characteristics of a high speed tapered roller bearing operating under conditions comparable to those existing at this input pinion shaft were defined. The tapered roller bearing shaft support configuration was developed for the gearbox using commercially available bearing designings. The configuration was optimized and interactive thermomechanically system analyzed. Automotive pinion quality tapered roller bearings were found to be reliable under load and speed conditions in excess of those anticipated in the helicopter transmission. However, it is indicated that the elastohydrodynamic lubricant films are inadequate. E.A.K.

N81-31550*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BALL BEARING MECHANICS
Bernard J. Hamrock and Duncan Dowson (Leeds Univ.) Jun. 1981 105 p refs Repr. from Ball Bearing Lubrication, Chapter 3, Sep. 1981
(NASA-TM-81691; E-209) Avail: NTIS HC A06/MF A01 CSCL 13I

Load-deflection relationships for different types of elliptical contacts such as those found in a ball bearing are developed. Simplified expressions that allow quick calculations of deformation to be made simply from a knowledge of the applied load, the material properties, and the geometry of the contacting elements are presented. Ball bearings subjected to radial, thrust and combined ball loads are analyzed. A design criterion for fatigue life of ball bearings is developed. The section of a satisfactory lubricant, as well as describing systems that provide a constant flow of lubricant to the contact, is considered. Author

N81-31551*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
UNIVERSAL CONNECTORS FOR JOINING STRINGERS Patent Application
Ernest Harrison, Jr., inventor (to NASA) (Mississippi Methodist Rehabilitation Center, Jackson) Filed 5 Jun. 1981 16 p Sponsored by NASA
(NASA-Case-LAR-12744-1; US-Patent-Appl-SN-270762) Avail: NTIS HC A02/MF A01 CSCL 13K

A lightweight, universal connector that joins stringers at various angles is discussed. The connectors are fabricated from fiber epoxy resin strips that wrap around stringers and have ends, tabs and extend in one general direction. The inside surface of the first tab lies on a plane defined by the joined stringers, and the second tab is separated from the first tab by a distance equal to their thickness. Stringers of different shapes and sizes are joined by alternately bonding the first tab of one connector between the first and second tabs of another connector. Tee joints are formed by web elements which partially wrap around a stringer and have tabs which are offset and bonded between tabs of universal connectors and bonded to another stringer. Sharp corners are trimmed from the tabs and a gusset area remains between the stringers for support. Acute angle through obtuse angle joints are formed by trimming those edges of the tabs which lie against the stringers. NASA

N81-31552# Bendix Corp., Kansas City, Mo.
PROGRESS IN THE BATTLE WITH THE BURR
L. K. Gillespie Apr. 1981 72 p Presented at the 3rd Intern. Deburring Conf., Cleveland, Oct. 1979 sponsored by the Society of Manufacturing Engineers
(Contract DE-AC04-76DP-00613)
(BDX-613-2306; CONF-7910229-1) Avail: NTIS HC A04/MF A01

Significant improvements in deburring are discussed. The mechanisms by which burrs form and by which one can predict their properties are documented, and some deburring economics are described. DOE

N81-31553# Bendix Corp., Kansas City, Mo.
ELECTROCHEMICAL DEBURRING
L. K. Gillespie Jul. 1981 94 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2594) Avail: NTIS HC A05/MF A01

The deburring of many features is often a time consuming and inherently operator variable process. Electrochemical deburring is a rapid and controlled process capable of removing burrs economically from many otherwise difficult feaures. On many edges, this type of deburring can maintain a 0.005-in. (127.0- (SIGMA)m) maximum edge break (radius). Although well suited for parts as small as a 1/4-in. cube, this process is found to be particularly suited for 303 stainless steel parts that have intersecting holes, hard to reach areas, threaded features, and multiple cutouts Observable side effects can be controlled and have presented no hindrances to production use on miniature parts. DOE

N81-31554# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.
HIGH TEMPERATURE TURBINE TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES Technical Progress Report, 1 Mar. - 31 Mar. 1981
Apr. 1981 9 p refs
(Contract DE-AC01-76ET-10348)
(CW-WR-76-02086; FE-2291-86) Avail: NTIS HC A02/MF A01

The technology of a high temperature, multistage, power turbine subsystem was advanced to a technology readiness condition. Technical data required to complete the turbine subsystem designs were tested. DOE

N81-31555# Corporate-Tech Planning, Inc., Waltham, Mass.
REVIEW OF ALTERNATE AUTOMOTIVE ENGINE FUEL ECONOMY Final Report, Jan. - Oct. 1978
David Cole, Jay A. Bolt, Paul Huber, and Theodore Taylor, Jr. Nov. 1980 72 p refs
(Contract DOT-HS-7-01789)
(PB81-186652; DOT-HS-805810) Avail: NTIS HC A04/MF A01 CSCL 13F

The potential of alternate automotive engines to meet the fuel economy goals and emission levels of the 1980-1990 period is assessed. Those developments offering viable substitutes fo the current spark ignition engine systems are reviewed. Categories assessed included stratified charge, diesels, turbo charging, rotary/Wankel engines, and the developmental gas turbine and Stirling cycle engines. GRA

N81-31556# Taylor Systems Engineering, Inc., Fair Oaks, Calif.
DIGITALLY-CONTROLLED ADAPTIVE WELDING SYSTEM
W. J. Kerth, Sr., W. J. Kerth, Jr., and H. Brandt Feb. 1981 52 p refs
(Grant NSF DAR-80-09700)

(PB81-183907; NSF/MEA-81002) Avail: NTIS HC A04/MF A01 CSCL 13H

The feasibility of an adaptive welding system using a light sectioning technique to obtain seam geometry information was established by a comparison of the results with those obtained by using a mechanical seam sensor. The shadow pattern contains geometric information which is detected by a solid state matrix camera interfaced with a computer. Experiments were performed with the light sectioning system to determine its suitability and resolution in the electrically noisy welding environment. Resolution in the defining seam surface geometry was adequate for most welding operations. The system is capable of accepting weld parameter changes during the welding process. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N81-31557 Missouri Univ. -Columbia.
ACCELERATED LIFE TESTING AND SAFE DOSE ESTIMATION WHEN THERE ARE COMPETING CAUSES OF FAILURE Ph.D. Thesis
John Peter Klein 1980 161 p
Avail: Univ. Microfilms Order No. 8117450

A general model for the distribution of each of the risks at a given stress is proposed. This model is shown to include most commonly used engineering models as special cases. It is also shown to provide an approximation to the standard model for estimating safe dose levels when there is a risk present. Maximum likelihood estimators of the model parameters are obtained when the component failure times are exponential or Weibull distributed and the life test is type I, type II, or progressively censored. The results of a simulation study as well as illustrative example are given for each model. Dissert. Abstr.

N81-31558# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
AN INTRODUCTION TO A RELIABILITY SHORTHAND M.S. Thesis
John Joseph Repicky, Jr. Mar. 1981 45 p ref
(AD-A102372) Avail: NTIS HC A03/MF A01 CSCL 14/4

The determination of a system's life distribution usually requires the synthesis of a mixture of system survival modes. In order to alleviate the normal non-trivial calculations, this paper presents the concept of a reliability shorthand. After describing the possible ways a system can survive a mission, the practitioner of this shorthand can use stock formulas to obtain a system's survival function. Then simple insertion of the failure rates of the system's components into the known equations results in the system's reliability. Simple examples show the convenience of this shorthand. The Ti-59 is demonstrated to be a useful tool, adequate to implement the methodology. Author (GRA)

N81-31559*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
SEQUENTIAL DECISION RULES FOR FAILURE DETECTION
Edward Y. Chow (Schlumberger-Doll Research, Ridgefield, Conn.) and Alan S. Willsky Jul. 1981 12 p refs
(Grant NGL-22-009-124; Contract N00014-77-C-0224; NR Proj. 041-516)
(NASA-CR-164847; AD-A102025; LIDS-P-1109) Avail: NTIS HC A02/MF A01 CSCL 12A

The formulation of the decision making of a failure detection process as a Bayes sequential decision problem (BSDP) provides a simple conceptualization of the decision rule design problem. As the optimal Bayes rule is not computable, a methodology that is baed on the Baysian approach and aimed at a reduced computational requirement is developed for designing suboptimal rules. A numerical algorithm is constructed to facilitate the design and performance evaluation of these suboptimal rules. The result of applying this design methodology to an example shows that this approach is a useful one. Author (GRA)

N81-31560# Lowell Univ., Mass
RELIABILITY OF ULTRASONIC WELD INTERROGATION METHODS, PHASE 1 Final Report, 29 Jun. 1979 - 29 Jun. 1980
Steven Serabian Washington, D.C. DOT Jan. 1981 259 p refs
(Contract DOT-RC-92014)
(PB81-194177; DOT-RSPA-DPB-50-81-4) Avail: NTIS HC A12/MF A01 CSCL 14B

A critical review of the present state-of-the ultrasonic methods and procedures available for the nondestructive evaluation of weldments is presented. The type of flaw considered was the planar- totally embedded reflector. Amplitude-dependent and amplitude-independent flaw characterization techniques are examined by theoretical and experimental means to assess detecting ability and reliability. Emphasis is given to flaw characterization in terms of location, size and orientation. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N81-31561 Illinois Univ., Urbana.
STRESS-ASSISTED DIFFUSION AND CONSOLIDATION WITH DOUBLE POROSITY Ph.D. Thesis
Rodney Kingston Wilson 1981 101 p
Avail: Univ. Microfilms Order No. 8114502

A stress-assisted diffusion theory is examined in terms of its physical appropriateness and mathematical foundations. A derivation of the basic equations under quite general assumptions is provided, a discussion of the physical interpretation and measurement of the phenomenological constants is given, and solutions to typical boundary value problems are obtained. The relevance of the theory to modeling the anelastic and elasto-diffusive phenomena is also illustrated. A consolidation theory with double porosity is examined in terms of the physical interpretation and experimental determination of its phenomenological coefficients and its solution to typical engineering problems. Specifically, analytical solutions to the column problem of hydroengineering and the borehole problem of petroleum engineering are obtained. The solutions are reduced to familiar results of classical consolidation theory with single porosity when one type of porespace shrinks to zero. Dissert. Abstr.

N81-31562 Wisconsin Univ., Madison.
THERMAL SHOCKING AN ELASTIC HALF-SPACE WITH A LASER PULSE Ph.D. Thesis
Mark Edward Dunbar 1981 151 p
Avail: Univ. Microfilms Order No. 8111453

The thermal and mechanical response of an isotropic elastic half-space subjected to the irradiance of a high-power short pulse laser is determined. The emphasis was toward the short-time response and took into account thermal inertia, the spatial and temporal laser pulse distributions and the uncoupled stress field. The solution to the wave equation of heat conduction was determined for one and three dimensions. The singular perturbation problem was pursued, showing that the solution to the one and three dimensional hyperbolic heat conduction equations do become the solutions to the one and three dimensional diffusive heat equations. The basic thermoelastic equation of motion for a homogeneous, isotropic medium was combined with the one dimensional forms of the stress and hyperbolic heat conduction equations using Fourier and Laplace transforms. The thermal wave phenomenon was found to be of importance for short time response of materials at high reference temperatures.
Dissert. Abstr.

N81-31563 Michigan Univ., Ann Arbor.
DUCTILE FRACTURE TOUGHNESS DETERMINED ON AN ENERGY BASIS USING POLYCARBONATE Ph.D. Thesis
Hiroyuki Uete 1981 149 p
Avail: Univ. Microfilms Order No. 8116350

The quasistatic crack propagation method of measuring fracture toughness of brittle materials is investigated. This method applies to both initiation and propagation of a crack running under quasistatic conditions. The applicability of the quasistatic propagation method is extended to a ductile fracture where displacement is not fully recoverable. It was found that by connecting the pop-in points of several specimens on a load displacement diagram, each specimen having a different initial crack length, plane-strain fracture toughness can be found with specimens whose thicknesses are small. The energy expended between the plane-strain and plane-stress portions of the fractured surface was separated, and the contributions of those two toughnesses to the total toughness was found. Dissert. Abstr.

N81-31564 Ohio State Univ., Columbus.
ANALYSIS AND DESIGN OF CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS Ph.D. Thesis
Wichai Chevapravatdumrong 1981 169 p
Avail: Univ. Microfilms Order No. 8115088

Continuously reinforced concrete pavement (CRCP), defined as a pavement that has no transverse expansion or contraction joints except at its end and at bridges or other structures, is discussed. As the age of CRCP increased, more distresses appeared, particularly those associated with irregular crack spacing, erratic crack patterns, excessive crack widths and excessive deflections. The boundary element method is used, due to its advantages over the domain methods, i.e., finite element method. The existing method, based on the weighted residual approach, is extended to thermoelasticity (one way coupling) for piecewise homogeneous isotropic system. CRCP's initial structural response due to shrinkage and temperature is predicted using the extended formulations. A CRCP design procedure is proposed based on the analysis results. Dissert. Abstr.

N81-31565 Rice Univ., Houston, Tex.
STUDIES OF DYNAMIC AND STATIC RESPONSE OF CYLINDRICAL LIQUID-STORAGE TANKS Ph.D. Thesis
Ashok Kumar 1981 193 p
Avail: Univ. Microfilms Order No. 8116972

Two aspects of the response of liquid-filled cylindrical elastic tanks are treated: (1) dynamic response to a vertical excitation of the base; (2) statical analysis under antisymmetrical forces of the type of obtained in analyses of the dynamic response of the tank to a lateral excitation. The dynamic response of a liquid-tank system is treated in a stepwise fashion by first examining the free vibrational characterisics of the system and then, investigating the harmonic and the transient behaviors through a modal superposition procedure. Based on the results of the free vibration analysis, approximate models are developed to predict, with acceptable accuracy, some of the modal characteristics of the liquid tank systems. Comprehensive numerical data are presented for analyzing and understanding the behavior of partially and fully filled tanks. Dissert. Abstr.

N81-31566 Illinois Univ. at Urbana-Champaign.
A STRESS ANALYSIS OF CIRCULAR CYLINDRICAL SHELL INTERSECTIONS, INCLUDING THE INFLUENCES OF REINFORCEMENT, CYCLICAL PLASTICITY AND FATIGUE Ph.D. Thesis
Dilip Prabhudas Rajkotia 1981 230 p
Avail: Univ. Microfilms Order No. 8114464

A unified in-depth study of the behavior of cylinder intersections is presented numerical evaluations are made of the stress fields in the vicinity of the cylindrical shell intersections. Included are variations of reinforcement configurations around the curve of intersection, variations of nozzle to cylinder diameter ratios, variations of angles of intersection, and cyclic plasticity. The finite element method is employed for this stress analysis. An algorithm is developed for an automated mesh generation covering the region of the cylinder intersection. A kinematic strain hardening material model is formulated for application to cases with cyclic plasticity. The results of the nonlinear analysis are incorporated with existing numerical techniques to predict the fatigue life of the components involved. Dissert. Abstr.

N81-31567 Illinois Univ. at Urbana-Champaign.
DYNAMIC RESPONSE OF TUNED SECONDARY SYSTEMS Ph.D. Thesis
Gene Conrad Ruzicka 1981 143 p
Avail: Univ. Microfilms Order No. 8114472

Light, flexible, secondary systems such as piping, penthouses and antenna towers are often attached to major structures. The dynamic response of secondary systems that are tuned to a natural frequency of the primary system is studied. Consideration is first given to simple structural models composed of a single-degree-of-freedom secondary system attached to a single-degree-of-freedom primary system. Formulas for the response of the secondary system are obtained for various damping configurations. The effects of a slight detuning of the secondary system are also examined. The response expressions are then used to develop estimates for the maximum response of the secondary system. The accuracy of these estimates is assessed in a numerical study in which the exact and approximate responses are compared. Lastly, an expression is obtained for the response of a multi-degree-of-freedom tuned secondary system attached to a multi-degree-of-freedom primary system.
Dissert. Abstr.

N81-31568 Stanford Univ., Calif.
BACK STRESSES IN MONOTONIC AND CYCLIC DEFORMATION: TRANSIENT AND STEADY STATE BEHAVIOR Ph.D. Thesis
Ali-Akbar Ziaai-Moayyed 1981 348 p
Avail: Univ. Microfilms Order No. 8115842

The Bauschinger effect experiment (B.E. experiment) and the stress transient experiment are used to measure back stresses. Investigation is made of the transient (small strain) as well as steady state (large strain) behavior of back stresses both during monotonic and cyclic deformation. Back stresses measured by B.E. experiment during both monotonic and cyclic deformation increase as a function of nonelastic strain and cyclic history and reach a saturation point at steady state. These increases were attributed to the microstructural changes which occur as a result of straining. The steady state back stresses measured by these experiments show that the ratio of the back stress to the applied stress remains constant (0.4 to 0.5) over a wide range of applied stress. The results of stress transient tests are consistent with prior results; the back stress (mean internal stress) to applied stress ratio reaches values as high as 0.6 at low stresses and as low as 0.3 at high stresses. Dissert. Abstr.

N81-31569 Rice Univ., Houston, Tex.
STRAIN-HARDENING AND RATE EFFECTS IN PLASTICITY Ph.D. Thesis
Lu-Tsuen Daniel Mei 1981 254 p
Avail: Univ. Microfilms Order No. 8116981

The effects of strain-hardening and rate sensitivity in plasticity theory are investigated. In this investigation of large plastic deformation, the displacement field of the wedge indentation and inverted plane strain extrusion problem can be specified by following the trajectory of each element during deformation processes. The unit diagram and the trajectory equations are utilized to specify the strain, strain rate fields for wedge indentation and extrusion problem, respectively. Finite element and finite difference schemes are used to calculate the total work required to produce indentation and extrusion process; work is then converted to the pressure or force. Dissert. Abstr.

N81-31570 Stanford Univ., Calif.
NONDESTRUCTIVE EVALUATION OF PATH-INDEPENDENT INTEGRALS IN FRACTURE MECHANICS Ph.D. Thesis
Richard Bruce King 1981 192 p
Avail: Univ. Microfilms Order No. 8115802

Nondestructive experimental evaluation of path-independent integrals is addressed. Experiments were conducted using both conventional stress analysis devices such as strain gages and displacement transducers and the technique of acoustoelastic stress measurement with ultrasonic waves. A variety of laboratory specimens containing cracks were used, subject to tensile (mode I) and combined (mixed mode) loading leading to both linearly elastic and elastic-plastic deformation. Results are presented which compare favorably with theoretical predictions.
Dissert. Abstr.

N81-31571 Stanford Univ., Calif.
ACOUSTOELASTIC MEASUREMENT OF RESIDUAL

STRESSES Ph.D. Thesis
Martin Philip Scott 1981 148 p
Avail: Univ. Microfilms Order No. 8115829

An acoustic method for the determination of residual stresses in planar metal specimens is presented. The techniques discussed have significant advantages for the rapid, non-destructive, evaluation of bulk residual stresses. The formula for determining the relative velocity shift of a longitudinal acoustic wave normally incident on a sample in a state of plane deformation is given. The coefficient B is called the acoustoelastic constant and can be determined experimentally. Wave transit time measurements used to ascertain the state of stress in the deformed medium. The velocity due to initial stress free anisotropy and the acoustoelastic constant are treated as variables of position across the sample. The problem of separating the relative contributions of initial anistropy and residual stress to acoustic velocity changes is addressed and an approximate solution proposed. These techniques are applied to specimens produced by hydrostatic extrusion, uniaxial compression, and welding, and the residual stresses determined. Dissert. Abstr.

N81-31572 Stanford Univ., Calif.
RESONATORS WITH SMALL APERTURES Ph.D. Thesis
Harlan Bennet Sexton 1981 78 p
Avail: Univ. Microfilms Order No. 8115830

The response of bounded cavities with thin, rigid walls and a single, small aperture, to time periodic excitations is considered. Only situations where the wave length of the incident wave is much greater than the width of the aperture are considered. The scattering and resonance problems are formulated in terms of finding solutions of the reduced wave equation with Neuman boundary conditions on the resonator, then reformulated, as integral equations on the aperture of the resonator. A method for the asymptotic solution of these equations is developed, and rigorous error estimates for this method are obtained for the case of two dimensions. It is proven that all resonances are asymptotic to some eigenvalue for the Neuman problem in the interior of the closed cavity. We also show that the real part of the resonance is always greater than the interior eigenvalue to which it tends, and that the imaginary part of the resonance is asymptotic to zero. Applications of the method to several scattering and resonance problems is described. Dissert. Abstr.

N81-31573 Maryland Univ., College Park.
PLATE BENDING FINITE ELEMENT BASED ON THE EXTENDED FIELD METHOD Ph.D. Thesis
Willi Walter Schur 1980 125 p
Avail: Univ. Microfilms Order No. 8117374

A thin plate bending finite element is developed and tested by a computer. The assumed displacement pattern for the element interior satisfies all the field equations. Thus, there is no need to resort to the variational principles of continuum mechanics. All approximations other than series truncation are made at the boundary. There is no need integrate over the two dimensional domain. Instead only integration along the boundary is required for a minimization scheme that enforces a best fit between the interior displacement and the separately assumed boundary displacement quantities. Equilibrium is enforced at the element boundaries by use of the Principle of Virtual Work. Hence this finite element may be characterized as a hybrid, boundary weighted residual finite element. Dissert. Abstr.

N81-31574 Michigan Univ., Ann Arbor.
AN ALGORITHM FOR EVALUATING THE BOUNDARY INTEGRAL EQUATIONS IN PLANAR ELASTO-PLASTIC BODIES Ph.D. Thesis
Madhukar Vable 1981 168 p
Avail: Univ. Microfilms Order No. 8116351

A numerical algorithm is developed for solving the boundary integral equations for two dimensional isotropic elasto-plastic bodies. The differential equations of the boundary value problem are converted into a set of integral equations using Fourier transforms and a body force analogy for plastic strains. The unknown function in the boundary integrals is approximated by a combination of Fourier series and a piecewise linear function. The piecewise linear representation is used in those regions of the boundary where it is anticipated that the unknown function has high gradients. The contribution of the singularities in the influence functions of the line integrals are evaluated numerically. The plastic strains are assumed to vary linearly in small regions of the plastic zone. The incremental theory of plasticity in conjunction with the von Mises yield criterion and the associated Prandtl-Reuss flow rule is used to determine the plastic strains. Numerically examples are solved to demonstrate the effectiveness of the algorithm for problems with corners, discontinuous loadings and multiple boundaries. Dissert. Abstr.

N81-31575 Illinois Univ. at Chicago Circle, Chicago.
THE CONTINUOUS DAMAGE THEORY OF BRITTLE MATERIALS AND ITS APPLICATIONS IN PLANE PROBLEMS Ph.D. Thesis
Gardihewa Upali Fonseka 1981 160 p
Avail: Univ. Microfilms Order No. 8116102

The mechanical behavior of an elastic solid continuum subjected to external loads and undergoing gradual deterioration due to the evolution of flat planar microdefects is analyzed. In conjunction with the physical nature of the damage and the internal state, a variable in the form of a vector is used to define a measure of damage. The kinematics of the void growth are identified and the expressions governing the void growth derived. The constitutive relations governing the mechanical behavior of the material under isothermal conditions and for plane problems are derived. A number of problems are solved to illustrate the capability of the continuous damage theory. The concept of damage surface is utilized to define the kinetics of the damage growth. The general restrictions on the shape of the fracture surface are analyzed and a suitable form for the fracture surface is presented. The validity of the theory is investigated. A computer program for the two dimensional stress analysis of structures undergoing continuous damage was developed. Dissert. Abstr.

N81-31576*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
THERMAL EXPANSION PROPERTIES OF COMPOSITE MATERIALS
Robert R. Johnson, Murat H. Kural, and George B. Mackey Hampton, Va. NASA. Langley Research Center Jul. 1981 61 p refs
(Contract NAS1-14887)
(NASA-CR-165632) Avail: NTIS HC A04/MF A01 CSCL 20K

Thermal expansion data for several composite materials, including generic epoxy resins, various graphite, boron, and glass fibers, and unidirectional and woven fabric composites in an epoxy matrix, were compiled. A discussion of the design, material, environmental, and fabrication properties affecting thermal expansion behavior is presented. Test methods and their accuracy are discussed. Analytical approaches to predict laminate coefficients of thermal expansion (CTE) based on lamination theory and micromechanics are also included. A discussion is included of methods of tuning a laminate to obtain a near-zero CTE for space applications. S.F.

N81-31577*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TENSION-TENSION FATIGUE BEHAVIOR OF THE SPACE SHUTTLE STRAIN-ISOLATION-PAD MATERIAL
Edward P. Phillips Aug. 1981 47 p refs
(NASA-TM-83183) Avail: NTIS HC A03/MF A01 CSCL 20K

The room temperature fatigue behavior of 0.41-cm (0.16-in) thick strain-isolation-pad (SIP) material was explored in a series of constant- and random-amplitude loading tests. The SIP material is used on the Space Shuttle to isolate the ceramic insulating tiles from the strains and deflections of the aluminum alloy airframe. In all tests, 12.7 by 12.7 cm (5.0 by 5.0 in) SIP specimens were subjected to tension-tension loading in the through-the-thickness direction at a frequency of 10 Hz. When subjected to cyclic loading, the SIP material exhibited a monotonic increase in thickness and a monotonic increase in tensile tangent moduli. The rate of thickness growth increased with increasing test stress level and decreased with increasing number cycles endured. Power law equations were found to provide a good representation of the thickness growth rate data. Tensile tangent moduli increased by as much as 80 percent during fatigue tests.

Simple cumulative damage fatigue models predicted the mean thickness growth under random-amplitude loading with reasonable accuracy (factor of 2 on life). Author

N81-31578*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRESS-INTENSITY FACTOR EQUATIONS FOR CRACKS IN THREE-DIMENSIONAL FINITE BODIES
J. C. Newman, Jr. and I. S. Raju Aug. 1981 51 p refs Presented at the 14th ASTM Natl. Symp. on Fracture Mech., Los Angeles, 30 Jun. - 2 Jul. 1981
(NASA-TM-83200) Avail: NTIS HC A04/MF A01 CSCL 20K

Empirical stress intensity factor equations are presented for embedded elliptical cracks, semi-elliptical surface cracks, quarter-elliptical corner cracks, semi-elliptical surface cracks at a hole, and quarter-elliptical corner cracks at a hole in finite plates. The plates were subjected to remote tensile loading. Equations give stress intensity factors as a function of parametric angle, crack depth, crack length, plate thickness, and where applicable, hole radius. The stress intensity factors used to develop the equations were obtained from three dimensional finite element analyses of these crack configurations. S.F.

N81-31579*# Lockheed Missiles and Space Co., Palo Alto, Calif.
GLOBAL FUNCTION APPROACH IN STRUCTURAL ANALYSIS: BASIC APPROACH, NUMERICAL RESULTS
B. O. Almroth, P. Stehling, and F. A. Brogan Apr. 1981 23 p refs
(Contract NAS1-10843)
(NASA-CR-165669) Avail: NTIS HC A02/MF A01 CSCL 20K

The structural response to a given environment is described by the differential equations of motion of deformable bodies. Analytic solutions of such problems for a reasonably large class of structural configurations are not within the realm of the possible. Consequently, the mathematical problem is recast into a numerical problem for solution on the computer. New technology in the space and energy fields led to a growing demand for accurate analysis which at times cannot be met due to the limits set by available budgets for computer time. In response to this need for more efficient numerical analysis, the possibilities of reducing the number of freedoms in the system through a revival of the global function approach were explored. L.F.M.

N81-31580*# Lockheed-Georgia Co., Marietta.
DEVELOPMENT OF AN ORTHOTROPIC HOLE ELEMENT
C. V. Smith (Georgia Inst. of Technology), J. W. Markham, J. W. Kelley, and K. Kathiresan Aug. 1981 128 p refs
(Contract NAS1-15840)
(NASA-CR-165759; LG81ER0159) Avail: NTIS HC A07/MF A01 CSCL 20K

A finite element was developed which adequately represents the state of stress in the region around a circular hole in orthotropic material experiencing reasonably general loading. This was achieved with a complementary virtual work formulation of the stiffness and stress matrices for a square element with center circular hole. The assumed stress state provides zero shearing stress on the hole boundary, so the element is suitable for problems involving load transfer without friction. The element has been implemented in the NASTRAN computer program, and sample problem results are presented. Author

N81-31581# California Inst. of Tech., Pasadena.
A STUDY OF THE TIME DEPENDENCE IN FRACTURE PROCESSES RELATING TO SERVICE LIFE PREDICTION OF ADHESIVE JOINTS AND ADVANCE COMPOSITES Final Report, 1 Feb. 1977 - 28 Feb. 1981
W. G. Knauss 30 Apr. 1981 157 p refs
(Contract F49620-77-C-0051; AF Proj. 2307)
(AD-A102367; GALCIT-SM-81-3; AFOSR-81-0590TR) Avail: NTIS HC A08/MF A01 CSCL 11/4

This report deals with developments in understanding adhesive fracture as related to structural bonds and composite materials. Both fracture mechanics based considerations as well as material related aspects are considered experimentally. One thrust of the program with the detailed measurements of the crack opening profile of a crack at a polymer-rigid (glass) interface. Very high resolution optical interferometry allowed a careful examination of the linearity response of the displacements in the fracture-critical area. The suprising results was that even at average strains across the bond line (in shear and in bone-normal deformation) on the order of 0.2% significant deviation from linear response is readily apparent. In view of the need to better understand the effect of moisture and temperature on the time dependence of adhesion and matrix materials hygro-thermoviscoelastic behavior of two materials was studied. Resolution of apparently complex material behavior was accomplished through a :free volume: argument for the material behavior. Based on this result the idea was close at hand that mechanical dilatation at relatively high stresses could lead to non-linear viscoelastic behavior, a concept that was born out with surprising accuracy in an analytical and experimental study. Description of pertinent (non-trivial) equipment developments round out this report. GRA

N81-31582# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
CRUSHING ANALYSIS OF ROTATIONALLY SYMMETRIC PLASTIC SHELLS
Joao G. deOliveira and Tomasz Wierzbicki 30 Jun. 1981 64 p refs
(Contract N00014-80-C-0616; NR Proj. 064-651)
(AD-A101999; Rept-81-8) Avail: NTIS HC A04/MF A01 CSCL 20/11

The crushing analysis of rotationally symmetric plastic shells undergoing very large deflections is presented. A general methodology is developed and simple closed form solutions which can be useful for practical applications are derived for the case of a conical shell and a spherical shell under point load, a spherical shell crushed between rigid plates and under boss loading, and a spherical cap under external uniform pressure. The effect of the end conditions and the limitations of this approach are discussed in detail. Author (GRA)

N81-31583# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
SHAPE OPTIMIZATION OF SHEET METAL STRUCTURES AGAINST CRASH
Tomasz Wierzbicki, Ture Akerstrom, and Clas Jernstrom Jul. 1981 44 p refs
(Contract N00014-80-C-0616; NR Proj. 064-651)
(AD-A102024; Rept-81-10) Avail: NTIS HC A03/MF A01 CSCL 20/11

A theoretical and experimental study was undertaken into the crushing behavior of axially compressed short thin-walled open-section columns. The effect of initial geometry of panels as well as distribution and magnitude of shape imperfections on the efficiency of energy absorption was examined. Results of model test on 0.1mm thick aluminum foil specimens have shown that the panels collapsing in the symmetric and asymmetric deformation mode provide respectively, upper and lower bound for the energy absorbed in any other buckling mode. In both of the extreme cases, the crush response of the panel was predicted theoretically with a reasonable accuracy. It is shown that an optimum design of columns against crush can be achieved by introducing a beneficial geometric imperfections of a specified magnitude shape so that the structure will be forced to collapse in the most energy efficient deformation mode. Author (GRA)

N81-31584# R and D Associates, Marina Del Rey, Calif.
CASIMIR SELF-STRESS ON A PERFECTLY CONDUCTING CYLINDRICAL SHELL
Lester L. DeRaad, Jr. and Kimball A. Milton (Ohio State Univ., Columbus) 1980 22 p refs
(Contract DE-AC02-76ER-01545)
(DOE/ER-01545-308) Avail: NTIS HC A02/MF A01

The Casimir stress on a perfectly conducting cylindrical shell, due to quantum field fluctuations (zero-point energy) in both the interior and exterior regions, is compared using a Green's dyadic formulation for the field strengths. To obtain a finite answer, a frequency cutoff must be inserted, but the result is independent of that cutoff. The Casimir stress is found to be attractive, the Casimir energy per unit length for a cylinder of radius a being: epsilon = -0.014/a2. DOE

N81-31585# Westinghouse Hanford Co., Richland, Wash.
LOW-LEVEL-VIBRATION EFFECTS ON SNUBBER LIFE
E. J. Renkey 1981 10 p refs Presented at the ASME PVP Conf., Denver, 21-26 Jun. 1981
(Contract DE-AC14-76FF-02170)
(HEDL-SA-2231; CONF-810625-17) Avail: NTIS HC A02/MF A01

Certain combinations of steady state vibration amplitudes and frequencies that reduce the life of mechanical seismic restraints are discussed. Pipe vibration testing identified eleven hanger locations where vibration amplitudes are in an amplitude and frequency range that may lead to shorter seismic restraint life. These locations are all on accessible Secondary Heat Transport System piping. Periodic inspections were instituted at these locations to provide early identification of damage to the seismic restraints before any pipe damage can be induced. Tests conducted to ascertain the critical range and inspection procedures instituted to identify any onset of restraint degradation are described. DOE

N81-31586# Bendix Corp., Kansas City, Mo.
DEVELOPMENT OF FRACTURE TOUGHNESS MEASUREMENT CAPABILITY BY ULTRASOUND Final Report
G. D. Swanson Jun. 1981 26 p refs
(Contract DE-AC04-76DP-00613)
(BDX-613-2625) Avail: NTIS HC A03/MF A01

A correlation was developed between ultrasonic wave propagation factors and fracture toughness for Ti-6Al-6V-2Sn alloy. The important microstructural dimensional for ultrasonic wave attenuation in this two-phase alloy. The important microstructural dimension for ultrasonic wave attenuation in this two-phase alloy appears to be the width of the Beta phase between the needlelike Alpha phase subgrains. Test specimens must have flat and parallel surfaces and be coupled to the ultrasonic transducer by a thin, uniform couplant layer. Good impedance matching of the specimen-couplant-transducer combination to the ultrasonic pulser-receiver is necessary for obtaining acceptable echo waveforms. DOE

N81-31587# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Plastiques.
THEORETICAL AND EXPERIMENTAL STUDY OF THE BEHAVIOR OF REINFORCED PLASTIC PLATES. PART 1: GENERAL THEORY [ETUDE THEORIQUE ET EXPERIMENTALE DU COMPORTEMENT DES PLAQUES EN PLASTIQUES ARMES. PREMIERE PARTIE: THEORIE GENERALE]
Jacques Rondal (Liege Univ.) and Fernand Vidouse Dec. 1980 52 p refs In FRENCH; ENGLISH summary Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-PL-14-Pt-1) Avail: NTIS HC A04/MF A01

The general theory of the behavior of reinforced plastic plates is briefly reviewed. Mechanical characteristics of constituents, composite mechanical characteristics, generalized Hookes law, and orthotropic materials are included. Macromechanic and micromechanic studies, strength criteria and safety coefficients are exposed. Author (ESA)

N81-31588# Royal Aircraft Establishment, Farnborough (England).
DIGITAL SPECTRAL ANALYSIS: A GUIDE BASED ON EXPERIENCE WITH AIRCRAFT VIBRATION
S. L. Buckingham Feb. 1981 58 p refs
(RAE-TR-81014; RAE-FS-140; BR78387) Avail: NTIS HC A04/MF A01

The guide emphasizes a practical engineering understanding of the techniques based on experience gained in their application to the analysis of flight measurements of aircraft vibration in buffet. Quantization, aliasing, windowing, practical application of the fast Fourier transform, and the averaging of spectra are discussed in full, as are cross-spectral analysis and the coherence function. The practical difficulties encountered when the duration of the available data is severely limited, and the use of the coherence function as a tool in the interpretation of complicated responses are explained. The fundamental principles, and the inherent limitations of the techniques are relevant to any sphere of application. Author (ESA)

N81-31589# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
NLR TEST RESULTS AS A DATABASE TO BE USED IN A CHECK OF CRACK PROPAGATION PREDICTION MODELS: A GARTEUR ACTIVITY
H. H. vanderLinden Nov. 1979 74 p refs
(NLR-TR-79121-U) Avail: NTIS HC A04/MF A01

The effect of variation in the gust load severity and ground-air-ground cycle on crack propagation behavior was studied by means of crack growth tests on 2 mm sheet specimens of 2024-T3 Alclad material provided with a central saw cut. The basic spectrum is based on a calculated load spectrum which corresponds with the severest usage experienced so far by actual F-27 operators. Data from a full scale fatigue test of a prototype F-27 are included, (the F-4 spectrum) and data from a number of constant amplitude tests carried out under a range of stress ratios. The generation of the load sequence is described. An ALGOL and a FORTRAN version of a program for random selection of flight types and load levels are listed. Author (ESA)

N81-31590# Kansas Dept. of Transportation, Topeka. Planning and Development Dept.
STUDY OF D-CRACKING IN PORTLAND CEMENT CONCRETE PAVEMENTS. VOLUME 2: LABORATORY PHASE Interim Report
John E. Bukovatz and Carl F. Crumpton Mar. 1981 75 p refs
(PB81-200081; FHWA/KS-81/2) Avail: NTIS HC A04/MF A01 CSCL 13B

Cores from 30 locations were taken and tested for compressive and tensile strength, core density, and freeze-thaw durability. Laboratory water penetration tests on newer pavement concretes, a dried aggregate field test section, and a condition comparison of adjacent pavement with and without traffic were made. D-crack deterioration did not relate to concrete density or strength; air entrained field concretes were the most freeze-thaw durable; smaller aggregate size did not relate to better freeze-thaw durability; heat drying the aggregate was not beneficial; pavement cores showed high water penetration; traffic promotes ravelling of D-crack surfaces but is not necessary for its occurrence. GRA

N81-31591# National Bureau of Standards, Washington, D.C.
A DIFFUSIVE CRACK GROWTH MODEL FOR CREEP FRACTURES
Tze-jer Chuang Mar. 1981 59 p refs
(Contract DE-AI05-80OR-20679)
(PB81-196883; NBSIR-81-2255) Avail: NTIS HC A04/MF A01 CSCL 20K

A grain boundary creep crack growth model is presented based on the assumptions that the crack propagates along the grain boundary by a coupled process of surface and grain boundary self diffusion, the adjoining grains behave elastically, and steady state conditions prevail. Under the action of the applied stress, atoms on the crack surfaces are driven by surface diffusion toward the crack tip from where they are deposited nonuniformly by grain boundary diffusion along the grain interface so that the grain boundary opens up in a wedge shape ahead of the advancing tip which in turn produces a misfit stress field. The total grain boundary stresses and opening displacements are solved from a system of integrodifferential equations. GRA

42 GEOSCIENCES (GENERAL)

N81-31592# Scripps Institution of Oceanography, La Jolla, Calif.
ADS REPORT NUMBER 4 Progress Report, Dec. 1977 - May 1978
S. Pazan Apr. 1981 60 p
(Contract N00014-80-C-0440)
(AD-A102111; SIO-REF-81-9) Avail: NTIS HC A04/MF A01 CSCL 08/11

Since 1976, three reports on oceanographic and meteorological conditions in the North Pacific have been produced by the NORPAX Data Program covering the period from June, 1976 through November, 1977. This is the fourth in the series, and

covers the period from December, 1977 through May, 1978. This issue contains: contour maps of monthly meaned Fleet Numerical Oceanographic Central (FNOC) air temperature, sea temperature, wind speed, wind direction, surface vapor pressure, and 700 mb height; NORPAX Data Management calculated wind stress, wind stress curl, wind shear velocity cubed, sensible heat flux. Latent heat flux; objectively analyzed TRANSPAC temperatures at discrete depths from White and Bernstein (SIO); monthly ADS buoy drifter displacement vectors from McNally (SIO).
Author (GRA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N81-31593 Stanford Univ., Calif.
EXPERIMENTAL STUDIES OF THE EFFECTS OF EPHEMERAL STREAM-FLOW DEPTHS ON INFILTRATION Ph.D. Thesis
John William Reeder 1981 193 p
Avail: Univ. Microfilms Order No. 8115823

The effects of varying surface-water depths typical of ephemeral streams on infiltration were determined. A simple algebraic representation for such infiltration was developed. A simple algebraic model was derived to be used to simulate infiltration under varying surface-water depths. The Green-Ampt model, in comparison with a Richards numerical model, was found to be such a feasible tool for representing one-dimensional infiltration under the action of fluctuating water depths. With caution, the Green-Ampt model, when using a constant effective suction head, may be used to represent one-dimensional infiltration under rapidly varying surface-water depths; and with limitations, it may be linked with appropriate surface-water flow models to determine the effect of infiltration on surface-water flow and advance. Dissert. Abstr.

N81-31594 Stanford Univ., Calif.
ATMOSPHERIC CORRECTION TO LANDSAT DATA FOR LIMONITE DISCRIMINATION Ph.D. Thesis
William Stephen Kowalik 1981 400 p
Avail: Univ. Microfilms Order No. 8115805

A simple equation describing the radiance measured by the LANDSAT satellites over Lambertian surfaces was used to model the effects of the additive path-radiance and skylight irradiance terms when band ratios are used. The model results show that if the path-radiance and skylight are not corrected, than ratio values (longer wavelength in numerator) increase significantly when proceeding from poorly-illuminated to well-illuminated topographic slopes of the same surface material. After a modeled pathradiance correction, this tendency is reduced, for example, in the 5/4 ratio by a factor of 4X across moderately steep topography. LANDSAT data for 183 test sites (pixel size) in the Yerington District, Nevada were studied from each of 6 images to test the conclusions from the modeling in a mineral exploration framework. The 183 test sites represent three major rock types: (1) limonitically-altered Jurassic quartz monzonite: (2) nonlimonitically altered Jurassic granodiorite rocks; and (3) Teritary volcanic rocks. Field and lab work on each site have characterized the rock type, intensity of iron oxide mineral development, surface topographic orientation, percentage vegetation cover, and vegetation species present. Dissert. Abstr.

N81-31595 Arizona Univ., Tucson.
SPECTRAL PROPERTIES OF ARIZONA SOILS AND RANGELANDS AND THEIR RELATIONSHIP TO LANDSAT DIGITAL DATA Ph.D. Thesis
Emilio Hubert Horvath 1981 196 p
Avail: Univ. Microfilms Order No. 8116702

The relationships between the spectral properties of Arizona soils and rangelands and their characteristics were studied. The per cent reflectance of soils was determined using a multispectral hand-held radiometer, and the spectral response of Arizona rangeland sites was measured by scanners aboard on orbiting satellite. These spectral properties were related, by means of stepwise multiple regressions, to various soil and site characteristics. It was shown that for central and southern Arizona rangelands, it is possible to define specific relationships between site characteristics and satellite measured spectral response. Less than ten site characteristics and their interactions explain considerable portions of the variability between mapping units for a given survey. These relationships are unique for specific locations, but they could easily be developed for a survey area and effectively used in the mapping process. Dissert. Abstr.

N81-31596*# National Oceanic and Atmospheric Administration, Houston, Tex.
METEOROLOGICAL SATELLITE DATA: A TOOL TO DESCRIBE THE HEALTH OF THE WORLD'S AGRICULTURE
T. I. Gray, Jr., D. G. McCrary, Principal Investigators, and L. Scott Feb. 1981 12 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E81-10204; NASA-CR-160953; EW-NI-04042;
LEMSCO-15978; JSC-17112) Avail: NTIS HC A02/MF A01 CSCL 02C

Local area coverage data acquired aboard the TIROS-N satellite family by the advanced very high resolution radiometer systems was examined to determine the agricultural information current. Albedo differences between channel 2 and channel 1 of the advanced very high resolution radiometer LAC (called EVI) are shown to be closely correlated to the Ashburn vegetative index produced from LANDSAT multispectral scanner data which have been shown to vary in response to 'greenness', soil moisture, and crop production. The statistical correlation between the EVI and the Ashburn Vegetative Index (+ or - 1 deg) is 0.86.
Author

N81-31597*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
A DESCRIPTION OF THE REFORMATTED SPRING SMALL GRAINS LABELING PROCEDURE USED IN TEST 2, PART 2 OF THE US/CANADA WHEAT AND BARLEY EXPLORATORY EXPERIMENT
W. F. Palmer and E. R. Magness, Principal Investigator Feb. 1981 42 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development
ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E81-10206; NASA-CR-160969; FC-LO-04000;
LEMSCO-15404; JSC-16827) Avail: NTIS HC A03/MF A01 CSCL 02C

The reformatted spring small grains labeling procedure is designed to be used for assigning crop identification labels to a predetermined and selected number of dots. The development and description of this procedure is presented. Author

N81-31598*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
CLASSIFICATION OF WHEAT: BADHWAR PROFILE SIMILARITY TECHNIQUE
Willa W. Austin Oct. 1980 32 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E81-10207; NASA-CR-160970; SR-LO-00499;
LEMSCO-15305; JSC-16826) Avail: NTIS HC A03/MF A01 CSCL 02C

The Badwar profile similarity classification technique used successfully for classification of corn was applied to spring wheat classifications. The software programs and the procedures used to generate full-scene classifications are presented, and numerical results of the acreage estimations are given. J.M.S.

N81-31599*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
WEATHER ANALYSIS AND INTERPRETATION PROCEDURES DEVELOPED FOR THE US/CANADA WHEAT

AND BARLEY EXPLORATORY EXPERIMENT
M. H. Trenchard, Principal Investigator Nov. 1980 49 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AGRISTARS)
(E81-10208; NASA-CR-160971; FC-LO-04014; LEMSCO-15612; JSC-16840) Avail: NTIS HC A03/MF A01 CSCL 02C

Procedures and techniques for providing analyses of meteorological conditions at segments during the growing season were developed for the U.S./Canada Wheat and Barley Exploratory Experiment. The main product and analysis tool is the segment-level climagraph which depicts temporally meteorological variables for the current year compared with climatological normals. The variable values for the segment are estimates derived through objective analysis of values obtained at first-order station in the region. The procedures and products documented represent a baseline for future Foreign Commodity Production Forecasting experiments. Author

N81-31600*# Elogic, Inc., Houston, Tex.
IMPROVED VERSION OF THE SPLIT ROUTINE FOR CLASSY
M. E. Rassbach, Principal Investigator Mar. 1981 16 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15951; Proj. AGRISTARS)
(E81-10210; NASA-CR-160973; SR-IX-04046) Avail: NTIS HC A02/MF A01 CSCL 02C

The theoretical basis for a new version of the SPLIT routine for CLASSY is developed. (The SPLIT routine is used to guess the positions of the parts of a cluster which is not normally distributed.) The proposed routine would be a faster, more accurate replacement for the existing SPLIT routine, which was developed on an ad hoc basis. J.M.S.

N81-31601*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE TO SATELLITE DOPPLER TRACKING (SSDT) FOR MAPPING OF THE EARTH'S GRAVITY FIELD Final Report, 1 Apr. 1980 - 31 Mar. 1981
G. Colombo, E. M. Gaposchkin, and M. Grossi Sep. 1981 107 p refs
(Grant NAG5-36)
(NASA-CR-164722) Avail: NTIS HF A06/MF A01 CSCL 08G

Two SSDT schemes were evaluated: a standard, low-low, SSDT configuration, which both satellites are in basically the same low altitude nearly circular orbit and the pair is characterized by small angular separation; and a more general configuration in which the two satellites are in arbitrary orbits, so that different configurations can be comparatively analyed. The standard low-low SSDT configuration is capable of recovering 1 deg X 1 deg surface anomalies with a strength as low as 1 milligal, located on the projected satellite path, when observing from a height as large as 300 km. The Colombo scheme provides an important complement of SSDT observations, inasmuch as it is sensitive to radial velocity components, while keeping at the same performance level both measuring sensitivity and measurement resolution. T.M.

N81-31602*# General Electric Co., St. Petersburg, Fla. Dept. of Corporate Research and Development.
IN-MINE TESTING OF A NATURAL BACKGROUND SENSOR, PART B Final Report
Francois D. Martzloff 7 Apr. 1981 49 p
(Contract NAS8-33064)
(NASA-CR-161847; SRD-81-020-Pt-B) Avail: NTIS HC A03/MF A01 CSCL 08I

The capability of a natural background sensor for measuring the thickness of top coal on a longwall face was examined. The limitations on the time during which tests could be performed, and the roof conditions, did not produce readings of top coal measurements during the shearer operation. It was demonstrated that the system is capable to survive operating conditions in the mine environment, while the static tests confirmed that the natural background sensor approach is a valid method of measuring top coal thickness in mines where the roof rock provides a constant radiation level. It is concluded that the practical results will improve sequent development of an integrated vertical control system which is information from the natural background system. E.A.K.

N81-31603*# Adjunct Systems, Inc., Huntsville, Ala.
FABRICATION AND TESTING OF A PROTOTYPE LONG-WALL FACE ALIGNMENT SYSTEM Final Technical Report [1981] 38 p
(Contract NAS8-34185)
(NASA-CR-161848) Avail: NTIS HC A03/MF A01 CSCL 08I

Fabrication and testing of a laser system for instantaneous location of a longwall shearer are summarized. Calculations and measurements for the design of a laser based system for monitoring and controlling the trajectory of the shearing machine as it progresses along the longwall face are reported. An early version was fabricated by employing simple mechanical contrivances and a standard miners lamp. It is concluded that the advantages of the early version is the ability to test the longwall face without approval from the Mine Safety and Health Administration. E.A.K.

N81-31604*# GeoScience Research Corp., Salisbury, Md.
TERRAIN PROFILING FROM SEASAT ALTIMETRY
R. L. Brooks Mar. 1981 59 p refs Sponsored by NASA, National Geodetic Survey and USGS
(NASA-CR-156878) Avail: NTIS HC A03/MF A01 CSCL 08B

To determine their applicability for terrain profiling, Seasat altimeter measurements were analyzed for the following geographic areas: (1) Andean salars of southern Bolivia; (2) Alaska; (3) south-central Arizona; (4) imperial Valley of California; (5) Yuma Valley of Arizona; and (6) Great Salt Lake Desert. Analysis of the data over all of these geographic areas shows that the satellite altimeter servo did not respond quickly enough to changing terrainn features. However, it is demonstrated that retracking of the archived surface return waveforms yields surface elevations over smooth terrain accurate to + or - 1 m when correlated with large scale maps. The retracking algorithm used and its verification over the salars of southern Bolivia are described. Results are presented for each of the six geographic areas. A.R.H.

N81-31605*# GeoScience Research Corp., Salisbury, Md.
ICE SHEET ALTIMETRY Final Report
R. L. Brooks Mar. 1981 32 p refs
(Contract NAS6-3117)
(NASA-CR-156877) Avail: NTIS HC A04/MF A01 CSCL 14B

Generalized surface slopes were computed for the Antarctic and Greenland ice sheets by differencing plotted contour levels and dividing them by the distance between the contours. It was observed that more than 90% of the ice sheets have surface slopes less than 1%. Seasat test mode-1 Seasat altimeter measurements over Greenland were analyzed by comparisons with collinear and intersecting normal mode Seasat altimeter passes. Over the ice sheet, the computed surface elevations from test mode-1 measurements were consistently lower by about 45 m and the AGC levels were down by approximately 6 dB. No test mode-1 data were acquired over Antarctica. It is concluded that analysis of the existing altimeter data base over the two ice sheets is crucial in designing a future improved altimeter tracking capability. It is recommended that additional waveform retracking be performed to characterize ice sheet topography as a function of geographic area and elevation. A.R.H.

N81-31606# Water Resources Council, Washington, D.C. Hydrology Committee.
ESSENTIALS OF GROUND-WATER HYDROLOGY PERTINENT TO WATER-RESOURCES PLANNING
1980 38 p refs
(Bull-16-Rev) Avail: NTIS HC A03/MF A01

Well established fundamental principles of ground water behavior and a knowledge of the ground water reservoirs of the Nation, coupled with investigative and analytical methods of ground water hydrology, provide for improved planning for management of the resource. The bulletin is intended to familiarize

water planners and managers with data requirements for ground water resource evaluation and with the analytical and predictive methods used in ground water investigation in support of planning operations. T.M.

N81-31607*# Adjunct Systems, Inc., Huntsville, Ala.
DESIGN OF A LASER SYSTEM FOR INSTANTANEOUS LOCATION OF A LONGWALL SHEARER Final Feasability Study Report
Richard Stein Jan. 1981 99 p
(Contract NAS8-34185)
(NASA-CR-161846; AS03040R1) Avail: NTIS HC A05/MF A01 CSCL 08I

Calculations and measurements for the design of a laser system for instantaneous location of a longwall shearer were made. The designs determine shearer location to approximately one foot. The roll, pitch, and yaw angles of the shearer track are determined to approximately two degrees. The first technique uses the water target system. A single silicon sensor system and three gallium arsenide laser beams are used in this technique. The second technique is based on an arrangement similar to that employed in aircraft omnidirectional position finding. The angle between two points is determined by combining information in an onmidirectional flash with a scanned, narrow beam beacon. It is concluded that this approach maximizes the signal levels. E.A.K.

N81-31608# Committee on Energy and Natural Resources (U.S. Senate).
WORLD PETROLEUM OUTLOOK, 1981
Washington GPO 1981 155 p refs Hearing before the Comm. on Energy and Nat. Resources, 97th Congr., 1st Sess., 22 Jan. 1981
(Publ-97-4; GPO-74-059) Avail: Committee on Energy and Natural Resources

The impact of the Iraq/Iran conflict and the resultant decrease in OPEC oil production on stocks of crude oil and distillates in the United Staes is considered as well as causes of fuel shortages in New England. Methods are proposed for assuring that holders of petroleum stocks, utilities, and industries use current supplies to act as a buffer against possible shortages. A.R.H.

N81-31609# California Dept. of Conservation, Sacramento. Div. of Mines and Geology.
RESOURCE ASSESSMENT OF LOW- AND MODERATE-TEMPERATURE GEOTHERMAL WATERS IN CALISTOGA, NAPA COUNTY, CALIFORNIA. REPORT OF THE SECOND YEAR, 1979 TO 1980 OF THE US DEPARTMENT OF ENERGY - CALIFORNIA STATE-COUPLED PROGRAM FOR RESERVOIR ASSESSMENT AND CONFIRMATION
L. G. Youngs, C. Forrest Bacon, Rodger H. Chapman, Gordon W. Chase, Chris T. Higgins, Hasmukhrai H. Majmundar, and Gary C. Taylor 10 Nov. 1980 522 p refs
(Contract DE-FG03-79ET-27035)
(DOE/ET-27035/T1) Avail: NTIS HC A22/MF A01

Statewide assessment studies included updating and completing the USGS GEOTHERM File for California and compiling all data needed for a California Geothermal Resources Map. The Calistoga effort was comprised of a series of studies involving different disciplines, including geologic, hydrologic, geochemical and geophysical studies. DOE

N81-31610# Siam Inst. for Mathematics and Society, Philadelphia, Pa.
THEORY FOR COLORING BIVARIATE STATISTICAL MAPS
Bruce E. Trumbo Stanford, Calif. Stanford Univ. Dec. 1980 54 p refs Sponsored in part by Environmental Protection Agency, DOE, Sloan Foundation and NSF
(Contract DE-AC02-80EV-10428)
(DOE/EV-10428/9; SU-TR-44) Avail: NTIS HC A04/MF A01

Some purposes that might be envisioned for statistical bivariate color maps are discussed. Principles for selection of coloring schemes for such maps, depending on purpose, are formulated. Color models involving perceptually important aspects (hue, saturation, brightness) give the theoretical basis for obtaining schemes that satisfy various criteria. Schemes are viewed as transformations from color models to the unit square. Principles are interpreted in terms of properties of transformations. Several schemes, including those used by the US Census Bureau, ones proposed elsewhere as improvements upon the Census Bureau schemes, and several new ones, illustrate the theory. DOE

N81-31611# Los Alamos Scientific Lab., N. Mex.
HOT DRY ROCK GEOTHERMAL POTENTIAL OF ROOSEVELT HOT SPRINGS AREA: REVIEW OF DATA AND RECOMMENDATIONS
Jennifer East May 1981 46 p refs
(Contract W-7405-eng-36)
(LA-8751-HDR) Avail: NTIS HC A03/MF A01

The Roosevelt Hot Springs area in west-central Utah possesses several features indicating potential for hot dry rock (HDR) geothermal development. The area is characterized by extensional tectonics and a high regional heat flow of greater than 105 mW/m(2). The presence of silicic volcanic rocks as young as 0.5 to 0.8 Myr and totaling 14 km(3) in volume indicates underlying magma reservoirs may be the heat source for the thermal anomaly. Several hot dry wells have been drilled on the periphery of the geothermal field. Information obtained on three of these deep wells shows that they have thermal gradients of 55 to 600C/km and bottom in impermeable Tertiary granitic and Precambrian gneissic units. The Tertiary granite is the preferred HDR reservoir rock because Precambrian gneissic rocks possess a well-developed banded foliation, making fracture control over the resevoir more difficult. Based on a fairly conservative estimate of 160 km(2) for the thermal anomaly present at Roosevelt Hot Springs, the area designated favorable for HDR geothermal exploration may be on the order of seven times or more than the hydrogeothermal area currently under development. DOE

N81-31612# Adviesbureau voor Geodesie, Deventer (Netherlands).
GENERALIZATION WITHIN AUTOMATED CARTOGRAPHIC SYSTEMS
Jun. 1980 39 p refs In DUTCH; ENGLISH summary
(RS-07-UT(3)) Avail: NTIS HC A03/MF A01

The literature pertaining to the state of the art in automated generalization procedures and algorithms for cartography was reviewed. The survey was directed towards practical solutions. No solution to the complete generalization process is available. For parts of the process, solutions are available which are, however, not always economically attractive or completely automated. It is expected that the solution to the problem of cartographic generalization will become easier with the advent of fast plotters and fast array processors. Author (ESA)

N81-31613# Royal Aircraft Establishment, Farnborough (England).
A TECHNIQUE FOR LINE EXTRACTION FROM LANDSAT MULTI-SPECTRAL SCANNER SATELLITE DATA WITH SOME APPLICATIONS OF THE TECHNIQUE
A. H. Benny Jan. 1981 42 p refs
(RAE-TR-81010; RAE-SPACE-592; BR78637) Avail: NTIS HC A03/MF A01

An automated technique is described for extracting lines from LANDSAT multispectral scanner images by means of density contour threading of the data. Lines are stored in the form of a series of X, Y coordinate pairs, sufficient coordinates being present to define each line with the required amount of detail. At a given contour level all possible lines are constructed which thread through the grid such that all locations to one side have a higher or similar value and all locations to the other side have a lower value. The image will in general yield several separate contour lines at any specified contour level. The method of searching for individual contour lines is based upon the observation that a line must run between any two adjacent pixels if one of them has a lower radiance value and the other a higher value than the selected level for the boundary line. If the selected level is the same as a pixel value, the line must run through that pixel, and to avoid missing this condition the test is altered to include the case in which one pixel has a lower value and the other a value greater than or equal to the selected level. Author (ESA)

N81-31614# Department of Agriculture, Washington, D.C. Economics and Statistics Service.

CROP AREA ESTIMATES USING GROUND-GATHERED AND LANDSAT DATA. A MULTITEMPORAL APPROACH: MISSOURI, 1979

James Weldon Mergerson Feb. 1981 30 p refs
(PB81-186751; AGESS-810223) Avail: NTIS HC A03/MF A01 CSCL 02D

Four channel data were used for the unitemporal approach. Eight channel data consisting of four channels from each of two dates were used for the multitemporal approach. The multitemporal data set and the two corresponding unitemporal data sets were analyzed using various procedures. Results indicated that the use of multitemporal data can significantly improve the precision of crop area estimates for corn, soybeans, and winter wheat, obtained using the unitemporal approach. GRA

N81-31615# National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.

SATELLITE IDENTIFICATION OF SURFACE RADIANT TEMPERATURE FIELDS OF SUBPIXEL RESOLUTION

Jeff Dozier Dec. 1980 17 p refs Sponsored in part by National Academy of Sciences - National Research Council
(PB81-184038; NOAA-TM-NESS-113; NOAA-81021710) Avail: NTIS HC A02/MF A01 CSCL 04B

A method is presented for identifying from NOAA TIROS-N series satellite data the magnitudes and subpixel areal coverages of two different surface radiant temperatures. The method utilizes the different response of the Planck function at different wavelengths. GRA

N81-31616# Geological Survey, Towson, Md. Water Resources Div.

WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1980

Mar. 1981 441 p
(PB81-195885; USGS-WDR-MD-DE-80-1; USGS/WRD/HD-81/033) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for Maryland and Delaware were recorded. Records consist of stage, discharge, and water quality of streams, stage and contents of lakes and reservoirs; and water levels and water quality of ground water wells. Records are reported for water discharge at 110 gaging stations; stage and contents at 1 reservoir; water quality at 46 gaging stations and 19 wells; and water levels at 27 observation wells. Also included are data for 14 crest stage, 56 low flow, and 4 tidal crest stage partial record stations. GRA

N81-31617# Kent State Univ., Ohio. Dept. of Biological Sciences.

PRECIPITATION AND INACTIVATION OF PHOSPHORUS AS A LAKE RESTORATION TECHNIQUE

G. Dennis Cooke and Robert H. Kennedy Feb. 1981 49 p refs Prepared in cooperation with Army Engineer Waterways Experiments Station, Vicksburg, Miss.
(PB81-196511; EPA-600/3-81-012) Avail: NTIS HC A03/MF A01 CSCL 08H

Treatment of lakes with aluminum sulfate and/or sodium aluminate is a successful method for removing phosphorus from the water column. Twenty-eight lake projects treated with aluminum salts were reviewed and are summarized. The technique is successful when sufficient doses of aluminum are applied, however, a few undesirable side effects such as reduced planktonic microcrustacea species diversity an increases in rooted plant biomass may occur. Two methods for determining aluminum sulfate doses are compared. Maximum dose, is defined as that dose which reduces pH to 6, a pH favorable for forming insoluble aluminum hydroxide and for assuring that dissolved aluminum remains below potentially toxic concentrations. GRA

N81-31618# Environmental Protection Agency, Chicago, Ill. National Program Office.

LAKE MICHIGAN INTENSIVE SURVEY 1976-1977 Final Report

David C. Rockwell, David S. DeVault, III, Marvin F. Palmer, Clyde V. Marion, and Robert J. Bowden Dec. 1980 199 p refs
(PB81-196636; EPA-905/4-80-003A) Avail: NTIS HC A09/MF A01 CSCL 08H

The Great Lakes monitoring program is described. A complete description is provided of methods and locations for all nearshore and open lake cruises. The southern basin survey data from 1976 are compared with the 1977 observations and it was found that a large and apparently natural removal of phosphorus occurred between the two surveys. It is suggested that the observed decrease of phosphorus may be due to the severe winter and extensive ice cover of 1976-1977. GRA

N81-31619# Montana State Univ., Bozeman. Dept. of Civil Engineering/Engineering Mechanics.

DEVELOPMENT OF A STREAMFLOW FORECASTING PROCEDURE FOR INTERMOUNTAIN BASINS Final Report

Alfred B. Cunningham Dec. 1980 33 p refs
(Contract DI-14-34-0001-9028)
(PB81-198442; MWRRC-113; W81-02726; OWRT-A-116-MONT(1)) Avail: NTIS HC A03/MF A01 CSCL 08H

A method for forecasting the magnitude and profile of streamflow hydrographs occurring primarily as result of snowmelt runoff was developed. The study contributes toward systematic water resources management in that it functions in supplying hydrologic data critical to operation of various types of surface water retention/regulation facilities. GRA

N81-31620# Kent State Univ., Ohio. Dept. of Biological Sciences.

COVERING BOTTOM SEDIMENTS AS A LAKE RESTORATION TECHNIQUE

G. Dennis Cooke May 1981 8 p refs Sponsored in part by EPA Submitted for publication
(PB81-200453; EPA-600/J-81-178) Avail: NTIS HC A02/MF A01 CSCL 08H

Sediment covering to control macrophytes and sediment nutrient release was reviewed. It is concluded that fly ash application to control sediment phosphorus release presents more dangers to the lake than benefits and should not be used. Polyethylene sheeting has not had long term effectiveness due to macrophyte regrowth on its surface. PVC-coated fiberglass screen is expensive but nontoxic and appears to give long term macrophyte control. Similar results may be obtained with spun bonded polypropylene. Sand, clay, and sheeting to retard nutrient release have received insufficient attention. GRA

N81-31621# Geological Survey, Anchorage, Alaska. Water Resources Div.

GEOHYDROLOGY OF THE DELTA-CLEARWATER ALASKA Final Water-Resources Investigation Report

Dorothy E. Wilcox Dec. 1980 31 p refs Prepared in cooperation with Alaska State Dept. of Natural Resources, Juneau
(PB81-200651; USGS/WRI/NTIS-80/92; WRI-80-92; USGS/WRD/WRI-81/023) Avail: NTIS HC A03/MF A01 CSCL 08H

The Delta Agricultural Project is developing more than 93 square miles of land in the study area. The alluvial aquifer consists of lenticular, interbedded deposits of silt, sand, and gravel. Ground water is both confined and unconfined. The potentiometric surface slopes approximately north at about 1 to 25 feet per mile. Well yields are as high as 1,500 gallons per minute from a well at Fort Greely. Average annual ground water discharge is estimated at more than 1,200 cubic feet per second. The aquifer is recharged by seepage through streambeds and by infiltration of precipitation. Hydrographs from observation wells reflect seasonal recharge pulses. GRA

N81-31622# Texas A&M Univ., College Station. Water Resources Inst.

CONTAMINANT TRANSPORT IN HYDROGEOLOGIC SYSTEMS Technical Research Completion Report, 1 Oct. 1978 - 31 Mar. 1981

Chia-Shyun Chen and Donald L. Reddell Mar. 1981 130 p refs
(Contract DI-14-34-0001-9046; DI-14-34-0001-0146; DI-14-34-0001-1146)
(PB81-202079; TR-114; W81-02907; OWRT-A-048-TEX(1))

Avail: NTIS HC A07/MF A01 CSCL 08H

The transportation process of a specific conservative ion species is analogous to transport of heat in the system. Analytical models of hot water injection into groundwater aquifers were developed. Two models were developed to examine the influence of a caprock of finite thickness on the thermal response of an aquifers. A graphical technique was developed to determine four pertinent aquifer thermal properties. The caprock thickness was found to influence aquifer temperature distribution only when the time after injection is long. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N81-31623 Wayne State Univ., Detroit, Mich.
GALLIUM-ARSENIDE MIS AND SIS SOLAR CELLS UTILIZING TIN-OXIDE Ph.D. Thesis
David John Brinker 1981 107 p
Avail: Univ. Microfilms Order No. 8117045

Metal insulator semiconductor solar cells using GaAs substrates were made with physically deposited tin oxide interfacial layers. Electron beam and resistive heating vacuum deposition techniques were used. Insertion of the tin oxide interfacial layers in Au-n GaAs base line cells resulted in an increase of greater than 50 percent in open circuit voltage and efficiency. The open circuit voltage was limited by pinholes in the tin oxide layer which resulted in shunting of the MIS cell structure. Auger electron spectroscopy analysis of the vacuum deposited tin oxide films showed them to have an oxygen to tin ratio of 1.60.
Dissert. Abstr.

N81-31624 Stanford Univ., Calif.
CHARACTERIZATION OF MATERIAL AND ELECTRICAL PROPERTIES OF POLYCRYSTALLINE SILICON FOR PHOTOVOLTIAC APPLICATIONS Ph.D. Thesis
Wendy Ann Orr 1981 160 p
Avail: Univ. Microfilms Order No. 8115819

Three possible device structures that promised higher efficiencies in polycrystalline silicon solar cells were investigated: the back surface field cell and n+/p cells with low temperature pre-diffusion of phosphorus or boron. It is shown that a comparison of localized measurements of the bulk resistivity and diffusion length with the defect structure and photovoltaic characteristics can be useful in evaluating polycrystalline solar cells. A model of the electronic configuration of grain boundaries was developed for large grain silicon. The model includes trapping states together with a potential at the boundary which produce band bending extending into the surrounding grains. The magnitude and extent of the boundary's electronic effects varies with the character of the boundary and with the method of material preparation. Dissert. Abstr.

N81-31625*# Portsmouth Public Schools, Va.
SOLAR HEATING AND HOT WATER SYSTEM INSTALLED AT JAMES HURST ELEMENTARY SCHOOL, PORTSMOUTH, VIRGINIA Final Report
Jul. 1981 166 p Sponsored in part by NASA. Marshall Space Flight Center
(Contract EM-78-F01-5205)
(NASA-CR-161830) Avail: NTIS HC A08/MF A01 CSCL 10B

Solar heating and a hot water system installed in an elementary school in Portsmouth, Virginia are examined. The building is zoned into four heating/cooling areas. Each area is equipped with an air handling unit that is monitored and controlled by central control and monitoring system. The solar system for the building uses a collector area of 3,630 sq. ft. of flat plate liquid collectors, and a 6,000 gallon storage tank. System descriptions, maintenance reports, detailed component specifications, and design drawings to evaluate this solar system are reported. E.A.K.

N81-31626*# McDonnell-Douglas Corp., St. Louis, Mo.
THE 50 AMP-HOUR NICKEL CADMIUM BATTERY MANUAL
D. A. Webb 13 Feb. 1981 82 p refs Revised
(Contract NAS5-23844)
(NASA-CR-166701) Avail: NTIS HC A05/MF A01 CSCL 10C

The battery is designed with a minimum battery to cell weight ratio consistent with adequate containment for operating conditions and dynamic environments and minimized weight. The battery is fully qualified and the environments to which it was successfully subjected were selected by NASA Goddard to cover a wide range of probable uses. The battery is suitable for either near-Earth geosynchronous missions, is compatible with passive or active thermal control systems and may be electrically controlled by a variety of changing routines. The initial application of the 50 A.H. Battery is a near-Earth mission aboard the LANDSAT D Satellite. T.M.

N81-31627*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESULTS OF THE ETV-1 BREADBOARD TESTS UNDER STEADY-STATE AND TRANSIENT CONDITIONS
Noel B. Sargent and Miles O. Dustin Aug. 1981 16 p refs Presented at the Elec. Vehicle Council Symp. 6, Baltimore, 21-23 Oct. 1981
(Contract DE-A101-77CS-51044)
(NASA-TM-82667; E-944; DOE/NASA/51044-21) Avail: NTIS HC A02/MF A01 CSCL 10A

Steady state tests were run to characterize the system and component efficiencies over the complete speed-torque capabilities of the propulsion system in both motoring and regenerative modes of operation. The steady state data were obtained using a battery simulator to separate the effects on efficiency caused by changing battery state-of-charge and component temperature. Transient tests were performed to determine the energy profiles of the propulsion system operating over the SAE J227a driving schedules. T.M.

N81-31628*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
GENERAL REVIEW OF THE MOSTAS COMPUTER CODE FOR WIND TURBINES
John Dungundji and John H. Wendell Jun. 1981 75 p refs
(Grant NsG-3303; Contract DE-AI01-76ET-20320)
(NASA-CR-165385; DOE/NASA/3303-1; ASRL-TR-197-1)
Avail: NTIS HC A04/MF A01 CSCL 10A

The MOSTAS computer code for wind turbine analysis is reviewed, and techniques and methods used in its analyses are described. Impressions of its strengths and weakness, and recommendations for its application, modification, and further development are made. Basic techniques used in wind turbine stability and response analyses for systems with constant and periodic coefficients are reviewed. E.A.K.

N81-31629*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
AEROELASTIC ANALYSIS OF A TROPOSKIEN-TYPE WIND TURBINE BLADE
F. Nitzsche Hampton, Va. NASA. Langley Research Center Jul. 1981 12 p refs Presented at the Intern. Colloq. on Wind Energy, Brighton, England, Aug. 1981
(Grant NGL-05-020-243)
(NASA-CR-165764) Avail: NTIS HC A02/MF A01 CSCL 10B

The linear aeroelastic equations for one curved blade of a vertical axis wind turbine in state vector form are presented. The method is based on a simple integrating matrix scheme together with the transfer matrix idea. The method is proposed as a convenient way of solving the associated eigenvalue problem for general support conditions. E.A.K.

N81-31630*# PRC Systems Sciences Co., Huntsville, Ala.
ELECTROCHEMICAL ENERGY STORAGE SUBSYSTEMS STUDY, VOLUME 1 Final Contractor Report, Oct. 1979 - Sep. 1981
Fred Q. Miller, Peter W. Richardson, C. L. Graff, M. V. Jordan, and V. L. Patterson Sep. 1981 341 p refs 2 Vol.
(Contract NAS3-21962)
(NASA-CR-165420-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 10C

The effects on life cycle costs (LCC) of major design and performance technology parameters for multi kW LEO and GEO energy storage subsystems using NiCd and NiH2 batteries and fuel cell/electrolysis cell devices were examined. Design, performance and LCC dynamic models are developed based on mission and system/subsystem requirements and existing or derived physical and cost data relationships. The models define baseline designs and costs. The major design and performance parameters are each varied to determine their influence on LCC around the baseline values. E.A.K.

N81-31631*# PRC Systems Sciences Co., Huntsville, Ala.
ELECTROCHEMICAL ENERGY STORAGE SUBSYSTEMS STUDY, VOLUME 2 Final Contractor Report, Oct. 1979 - Sep. 1981
Fred Q. Miller, Peter W. Richardson, C. L. Graff, M. V. Jordan, and V. L. Patterson Sep. 1981 259 p refs 2 Vol.
(Contract NAS3-21962)
(NASA-CR-165420-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 10C

The effects on life cycle costs (LCC) of major design and performance technology parameters for multi kW LEO and GEO energy storage subsystems using NiCd and NiH2 batteries and fuel cell/electrolysis cell devices were examined. Design, performance and LCC dynamic models are developed based on mission and system/subsystem requirements and existing or derived physical and cost data relationships. The models are exercised to define baseline designs and costs. Then the major design and performance parameters are each varied to determine their influence on LCC around the baseline values. E.A.K.

N81-31632*# Avco-Everett Research Lab., Mass.
CONCEPTUAL DESIGN STUDY OF POTENTIAL EARLY COMMERCIAL MHD POWERPLANT. REPORT OF TASK 2 RESULTS Final Report
Finn A. Hals Mar. 1981 247 p refs
(Contracts DEN3-51; DE-AI01-77ET-10769)
(NASA-CR-165235; DOE/NASA/0051-2) Avail: NTIS HC A11/MF A01 CSCL 10B

The conceptual design of one of the potential early commercial MHD power plants was studied. The plant employs oxygen enrichment of the combustion air and preheating of this oxygen enriched air to an intermediate temperature of 1200 F attainable with a tubular type recuperative heat exchanger. Conceptual designs of plant componets and equipment with performance, operational characteristics, and costs are reported. Plant economics and overall performance including full and part load operation are reviewed. The projected performance and estimated cost of this early MHD plant are compared to conventional power plants, although it does not offer the same high efficiency and low costs as the mature MHD power plant. Environmental aspects and the methods incorporated in plant design for emission control of sulfur and nitrogen are reviewed. E.A.K.

N81-31633*# Novar Electronics Corp., Barberton, Ohio.
SONIC SIMULATION OF THE SPS POWER BEAM Final Report
James H. Ott and James S. Rice 31 Mar. 1981 106 p refs
(Contract NAS9-16055)
(NASA-CR-161049) Avail: NTIS HC A06/MF A01 CSCL 10A

A Satellite Power System Microwave Transmission Simulator is described. The simulator generates and transmits a beam audible sound energy which is mathematically similar to the microwave beam which would transmit energy to Earth from a Solar Power Satellite. This allows areas such as power beam formation to be studied in a laboratory environment. L.F.M.

N81-31634*# Alabama A & M Univ., Huntsville. School of Technology.
PARAMETRIC STUDY OF THERMAL STORAGE CONTAINING ROCKS OR FLUID FILLED CANS FOR SOLAR HEATING AND COOLING, PHASE 2 Final Report
Hrishikesh Saha Feb. 1981 47 p refs
(Grant NsG-8041)
(NASA-CR-161841) Avail: NTIS HC A03/MF A01 CSCL 10C

The test data and an analysis of the heat transfer characteristics of a solar thermal energy storage bed utilizing water filled cans and standard bricks as energy storage medium are presented. This experimental investigation was initiated to find a usable heat intensive solar thermal storage device other than rock storage and water tank. Four different sizes of soup cans were stacked in a chamber in three different arrangements-vertical, horizontal, and random. Air is used as transfer medium for charging and discharge modes at three different mass flow rates and inlet air temperature respectively. These results are analyzed and compared, which show that a vertical stacking and medium size cans with Length/Diameter (L/D) ratio close to one have better average characteristics of heat transfer and pressure drop. T.M.

N81-31635# Joint Economic Committee (U. S. Congress).
ENERGY CONSERVATION: EMERGING CONSENSUS, DIVERGING COMMITMENT
Washington GPO 1980 43 p refs Presented to the Subcomm. on Energy of the Joint Econ. Comm., 96th Congr., 2nd Sess., 31 Dec. 1980
(GPO-72-109) Avail: SOD HC

The role of energy conservation in national energy policy is considered. Energy conservation is defined. The level of Federal financial incentives for energy conservation and energy production is examined. It is concluded that the financial incentives for energy production are seven times greater than those for energy conservation. The impact of the bias against energy conservation on national energy security is discussed. J.D.H.

N81-31636# Committee on Science and Technology (U. S. House).
ENERGY FROM BIOMASS AND SOLID WASTES: PROSPECTS AND CONSTRAINTS
Paul F. Rothberg Washington GPO 1980 183 p Seminar held 25 Oct. 1979, Proc. Presented to the Subcomm. on Nat. Resources and Environ., Subcomm. on Sci., Res., and Technol., and Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., Jun. 1980 Prepared by Congressional Research Service, Library of Congress
(GPO-62-872) Avail: SOD HC

Federal programs and policies regarding energy from biomass and solid wastes; current research efforts and problems concerning the recovery of energy from these renewable resources; international and industrial efforts in these areas; and environmental impacts of converting biomass to useful energy products are examined in these proceedings of a seminar held to assist legislators in making decisions regarding national policy. A.R.H.

N81-31637# Committee on Science and Technology (U. S. House).
FLORIDA'S RENEWABLE ENERGY POTENTIAL
Washington GPO 1980 229 p refs Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 166, 16 May 1980
(GPO-68-757) Avail: Subcommittee on Energy Development and Applicatons

Developments in the commercialization of biomass, solar energy conversion, and other renewable energy sources are considered. The role and performance of the Southern Solar Energy Center are reviewed, and solar energy conversion projects surveyed. The production of fuel alcohol from biomass is discussed. The use of forest biomass and tree farming for biomass is considered for cogeneration and for thermal energy production. Sources of waste biomass are identified. J.D.H.

N81-31638# Committee on Science and Technology (U. S. House).
COGENERATION
Washington GPO 1980 608 p refs Hearings before the

Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 96th Congr., 2nd Sess., No. 155, 22-23 Jul. 1980
(GPO-68-746) Avail: NTIS · Avail: Subcommittee on Energy Development and Applications

Portions of the National Gas Policy Act the Fuel Use Act, and the Public Utility Regulatory Policies Act all offer financial and regulatory breaks for cogeneration. Some of these incentives, however, work at cross purposes, creating confusion about Federal intentions and national goals for conservation and primary fuel use. The nature and scope of the conflicts and what the Government needs to do to increase use of cogenerations systems are discussed especially since direct coal combustion technologies, novel heat engines, solar thermal power systems, and other technologies under development are made more economically attractive when cogeneration applications are considered. A.R.H.

N81-31639# Altus Corp., San Jose, Calif.
HI-G LITHIUM THIONYL CHLORIDE FLAT CELLS FOR ARTILLERY/AIR DELIVERED EXPENDABLES Quarterly Report, 2 Jan. - 31 Mar. 1981
D. Snuggerud, J. Surprenant, R. Waterhouse, T. Doss, and D. Noll Fort Monmouth, N.J. Army Electronics Reseach and Development Command Aug. 1981 16 p
(Contract DAAK20-80-C-0314; DA Proj. 1L2-63702-DG-10)
(AD-A102083; DELET-TR-80-0314-2; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10/3

Further development of the single-anode design has resulted in significant progress toward meeting the Hi-G performance goals. Capacities up to 14 ampere-hours have been demonstrated. Initial development of the double-anode design was begun and capacities up to 13 ampere-hours have been demonstrated. Author (GRA)

N81-31640# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
RELATIVE ENERGY RISK: IS SOLAR ENERGY RISKIER THAN NUCLEAR
Herbert Inhaber 1981 19 p refs
(Contract W-7405-eng-26)
(CONF-810542-3) Avail: NTIS HC A02/MF A01

The discussion of risk analysis is divided into three parts: (1) a discussion of the methodology which can be used; (2) a listing of some of the major assumptions; and (3) the results of a comparison of eleven energy systems. The energy systems considered are divided into two groups: conventional, i.e., those in fairly widespread use, like coal or nuclear, and nonconventional, i.e., all others, like solar and wind. Compared to some conventional systems like natural gas and nuclear, technologies like solar and windpower have relatively high risk. Because of the dilute nature of the energy they handle, solar and wind systems, when compared on the quality of their energy production, require a considerable amount of apparatus as compared to other systems. In turn, this apparatus requires a large amount of material and construction labor to build and install. Associated with each ton of material and hour of labor is a definite number of accidents, diseases and deaths, according to labor statistics. DOE

N81-31641# Eagle-Picher Industries, Inc., Seneca, Mo.
DEVELOPMENT OF A MAINTENANCE-FREE 100 AMPERE-HOUR LEAD-ACID BATTERY FOR DEEP DISCHARGE PHOTOVOLTAIC APPLICATIONS
Charles Farris 1981 7 p Presented at the 4th DOE Battery and Electrochem. Contractor's Conf., Washington, D.C., 2 Jun. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-7120C; CONF-810642-3) Avail: NTIS HC A02/MF A01

Progress in evaluating the design and component materials for the development of six volt 100 amp-hr maintenance-free lead-acid batteries for deep discharge photovoltaic applications is described. DOE

N81-31642# Westat Research, Inc., Rockville, Md.
NONRESIDENTIAL BUILDING ENERGY CONSUMPTION SURVEY Final Report
Mar. 1981 223 p refs
(Contracts DE-AC01-78EI-06389; EI-78-C-016389)
(DOE/EIA-0288) Avail: NTIS HC A10/MF A01

A building survey designed to provide data on the characteristic of a building's structure, activities inside the building, heating and air conditioning equipment, and the types and uses of energy, consumed, is described. The sample selection plan is included. A total of 7322 nonresidential buildings were selected and 6222 interviews were completed. The tasks performed in order to select the samples and interview appropriate respondents knowledgeable about their building's characteristics, operations, and energy use are detailed. DOE

N81-31643# Kaiser Engineers, Oakland, Calif.
INDUSTRIAL UTILIZATION OF WASTE DERIVED ENERGY
Jun. 1981 190 p refs
(Contract DE-AC03-78CS-20030)
(DOE/CE-20030/1) Avail: NTIS HC A09/MF A01

A technical and economic feasibility study of a partial oxidation unit was conducted. Major objectives of the program were: (1) disposal of both urban (municipal refuse and sewage sludge) and agricultural (dairy) wastes; and (2) the production of a medium-Btu fuel gas. The investigated wasteshed includes those portions of Western San Bernardino County, Eastern Los Angeles County, and Northwestern Riverside County. The available waste supply, transportation of these waste materials, product quantities and energy products of fuel gas steam, and electricity, markets, ferrous metals, aluminum, nonferrous metals, and slag are studied. DOE

N81-31644# Barton-Aschmann Association, Inc., Evanston, Ill.
OVERVIEW OF ENERGY-CONSERVING DEVELOPMENT PLANNING AND DESIGN TECHNIQUES BASED ON FIVE CASE STUDIES
Jun. 1980 229 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV-TM-59) Avail: NTIS HC A11/MF A01

Ways to conserve energy through development planning and site design in five old, new, and planned communities are presented. Two approaches were used: (1) a conventional, preexisting plan was analyzed to determine potential energy use; (2) energy conservation options were independently identified and evaluated. DOE

N81-31645# Republic Geothermal, Inc., Santa Fe Springs, Calif.
CO2 AND CARBONATE CHEMISTRY APPLIED TO GEOTHERMAL ENGINEERING. GUIDANCE FOR INTERPRETING AND USING CHEMICAL DATA ABOUT GEOTHERMAL RESOURCES
Donald E. Michels Jan. 1981 32 p refs
(Contract W-7405-eng-48)
(LBL-11509) Avail: NTIS HC A03/MF A01

The chemistry of high HCO3 resources is emphasized because they present complications about data interpretation, development of vapor, and potential for scale deposition. Solubility of CO2 and its exsolution from liquids is treated according to the context presented by geothermal resources. Contrasts between this approach and the treatment of CO2 solubility in physical chemistry and other geochemical contexts are presented. Dimensional units for solubility coefficients different from those of physical chemists are presented to favor engineering application. The effects of CO2 on wellbore flow, initiation of flashing, and depth of the 2-phase zone are described and illustrated with examples. DOE

N81-31646# Center for Research on the Acts of Man, Philadelphia, Pa.
MODELING ENERGY AND SOCIETY: THEORY AND METHOD IN ASSESSING THE SOCIAL EFFECTS OF ENERGY POLICIES. VOLUME 1: EXECUTIVE SUMMARY Final Report
Samuel Z. Klausner and Robert H. Edelstein Dec. 1980 15 p 3 Vol.
(Contract FEA-CO-04-60588-00)
(DOE/TIC-1022359) Avail: NTIS HC A02/MF A01

A positive correlation is found between unemployment and per-capita energy use. The social theory upon which the study model is based anticipates this otherwise counterintuitive finding. It is not the number of men or machines at work but the number

of social roles and the intensity of activity in those roles which determine the level of energy consumption. The feasibility is assessed of a society/energy model which, when completed, may be used to monitor and to forecast the social effects of energy policies. Such is found to be feasible. DOE

N81-31647# Center for Research on the Acts of Man, Philadelphia, Pa.
MODELLING ENERGY AND SOCIETY: THEORY AND METHOD IN ASSESSING THE SOCIAL EFFECTS OF ENERGY POLICIES. VOLUME 2: SOCIAL MEANINGS OF ENERGY Final Report
Samuel Z. Klausner and Robert H. Edelstein Dec. 1980 216 p refs 3 Vol.
(Contract FEA-C0-04-60588-00)
(DOE/TIC-1022360) Avail: NTIS HC A10/MF A01

The feasibility of a society/energy model was demonstrated which, when completed, may be used to monitor and to forecast the social effects of energy policies. A philisophical grounding for relating social scientific concepts to social policy is given. Guidelines are provided for interpretation of social activities and rules for conceptualizing those activities in several institutional contexts, religious, political and economic, and in the energy social system system itself. DOE

N81-31648# Center for Research on the Acts of Man, Philadelphia, Pa.
MODELLING ENERGY AND SOCIETY: THEORY AND METHOD IN ASSESSING THE SOCIAL EFFECTS OF ENERGY POLICIES. VOLUME 3: THE MEASUREMENT MODEL Final Report
Samuel Z. Klausner and Robert H. Edelstein Dec. 1980 146 p refs 3 Vol.
(Contract FEA-C0-04-60588-00)
(DOE/TIC-1022361) Avail: NTIS HC A07/MF A01

A mathematical statement is presented of typical equations expressing causal relations between measures of physical energy consumption and both the attributes of various social institutions and the behavior of actors in those institutions. A way of testing the proposed model with empirical data is demonstrated. National, annualized time-series data from published sources for the period from 1960 to 1974 were used, and empirical tests of the model were limited to three strategic types of energy policies: those involving fuel price controls; changes in employment rates; and changes in economic output. DOE

N81-31649# Oak Ridge National Lab., Tenn.
NET ENERGY OF SEVEN SMALL-SCALE HYDROELECTRIC POWER PLANTS Final Report
M. W. Gilliland, J. M. Klopatek, and S. G. Hildebrand Jul. 1981 119 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7694; ESD-PUBL-1678) Avail: NTIS HC A06/MF A01

The net energy results are expressed as the ratio of energy output to energy input. Two ratios were developed. In the first (R1), the energy output, expressed as electrically, was divided by the energy subsidy; in the second (R2), the energy output, expressed as the fossil fuel equivalent of electricity, was divided by the energy input. The results indicate that the energy output from the seven plants is 8.6 to 32.9 times greater than the energy input for the R1 case, and 26.3 to 101.4 times greater than the energy input for the R2 case. On the net energy criterion, the small scale plants are better than conventional peak load hydroelectric plants and similar to conventional base load hydroelectric plants. DOE

N81-31650# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
LOW-COST EPITAXIAL TECHNIQUES FOR SOLAR-CELL FABRICATION Final Report, 25 Sep. 1979 - 24 Sep. 1980
R. V. DAiello and P. H. Robinson Nov. 1980 70 p refs
(Contract DE-AC02-77CH-00178)
(SERI/TR-8274-1-T1) Avail: NTIS HC A04/MF A01

Epitaxial growth processes which allow the use of low cost forms of silicon for fabricating high efficiency, cost effective solar cells were investigated. The results of a 1-y effort involve characterization of potentially low cost silicon substrates, epitaxial growth studies, and the fabrication and evaluation of solar cells made in the epitaxial layers. Silicon substrates prepared from metallurgical grade silicon by potentially low cost purification and growth techniques form satisfactory substrates for epitaxial growth and the fabrication of 10 to 12% efficient solar cells. The allowable range of variation in the key parameters of the epitaxial process and cell structures was determined and it was found that a greater variation in these parameters is possible for solar cells compared with those required for epitaxial devices. DOE

N81-31651# Lockheed Missiles and Space Co., Sunnyvale, Calif. Ocean Energy Systems.
OCEAN THERMAL ENERGY CONVERSION POWER SYSTEM DEVELOPMENT-2, PHASE 2 Final Design Report
1 Jun. 1981 160 p refs
(Contracts DE-AC02-78ET-21056; ET-78-C-01-3407)
(DOE/ET-21056/T3) Avail: NTIS HC A08/MF A01

The detailed design of the power system development is presented. The trade studies and related investigations are reviewed. The design and functional requirements for the 10 MW(e) power system and the 0.2 MW(e) heat exchanger test articles are listed. The primary objectives of the total program are given. The major test article components and the related biofouling and corrosion countermeasures are discussed. Performance and diagnostic instrumentation and related data analysis, a proposed OTEC-1 test article installation, and a recommended plan for the conduct of the test program are presented. DOE

N81-31652# Acres American, Inc., Columbia, Md.
SMALL HYDRO PLANT DEVELOPMENT PROGRAM
Oct. 1980 322 p refs Prepared for Edgerton, Germeshausen and Grier, Idaho Falls, Idaho
(Contract DE-AC07-76ID-01570)
(DOE/ID-01570/T21-Vol-2-App-A-K) Avail: NTIS HC A14/MF A01

The technical and economic feasibility of using pump turbine - induction motor (generators) packages in lieu of standardized turbogenerator units in small hydro development projects was reported. The following topics are considered: (1) listing of Hydroelectric Power Resources by State; (2) Manufacturers' Data on Standardized Hydroturbines; (3) Inventory of Available Pumping Equipment; (4) Characteristics of Representative Pumps; (5) Survey of Pump Manufacturers and Engineering Firms; (6) Model Pump Mode and Turbine Mode Characteristics; (7) Prototype Turbine Mode Characteristics; (8) Pump (Turbine) Motor (Generator) Equipment Packages; (9) Manufacturers' Data on Components of Equipment Packages; (10) Overspeed Calculations; and (11) Economic Evaluation.DOE

N81-31653# Ehrenkrantz Group, New York, N. Y.
IDENTIFICATION OF PRODUCT AND MATERIAL DIFFERENCES IN ACTIVE SOLAR SYSTEMS
Stephen D. Weinstein 30 Sep. 1980 81 p Prepared in cooperation with Mueller Associates, Inc.
(Contract W-31-109-eng-38)
(ANL-K-81-74) Avail: NTIS HC A05/MF A01

Deficiencies in products and materials used in active solar systems are identified. Architects and engineers were interviewed concerning design of solar installations, computer modeling, reliability and durability, project review, and construction administration. The responses of manufacturers of solar equipment to the evaluations of the design community are presented. DOE

N81-31654# Varta Batterie A.G., Hanover (West Germany).
FABRICATION AND TESTING OF A PROTOTYPE GAS-RECOMBINATION DEVICE FOR UTILITY LEAD-ACID CELLS Final Report, 1 Aug. 1979 - 31 Mar 1980
A. Winsel, H. Laig-Hoerstebrock, K. Ledjeff, M. Tochtermann, and R. Schneider Aug. 1980 76 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-80-8) Avail: NTIS HC A05/MF A01

A prototype hydrogen-oxygen gas recombination device (HORD) was fabricated. The 435-W HORD was tested for performance and gas recombination efficiency using cyclinder H2 and O2 gases at various ratios and at various gas flow rates; high (100%) recombination efficiencies were obtained at all conditions tested. Temperature profiles of the HORD showed

an even temperature distribution with no hot spots. The pressure was found to be dependent on the pressure of surplus gases. Higher outside temperatures had a negligible effect on performance. The stibine-arsine removal device was found to be very effective; removal efficiencies may be decreased if water vapor condenses on the activated charcoal. The HORD was also tested with a lead-acid cell over a cycle simulating a typical utility load-leveling application. The system operated gas-tight and maintenance-free. Safety applicances are discussed for cases of high and low explosive gas concentrations inside the HORD. A theoretical model of HORD operation is presented. DOE

N81-31655# Stanford Univ., Calif.
SOLAR SPACE- AND WATER-HEATING SYSTEM AT STANFORD UNIVERSITY. CENTRAL FOOD SERVICES BUILDING Final Report
May 1980 143 p refs
(Contract DE-AB03-77CS-31522)
(DOE/CS-31522/T2) Avail: NTIS HC A07/MF A01

The closed-loop drain-back system is described as offering dependability of gravity drain-back freeze protection, low maintenance, minimal costs, and simplicity. The system features an 840 square-foot collector and storage capacity of 1550 gallons. The acceptance testing and the predicted system performance data are briefly described. Solar performance calculations were performed using a computer design program (FCHART). Bidding, costs, and economics of the system are reviewed. Problems are discussed and solutions and recommendations given. An operation and maintenance manual is given. DOE

N81-31656# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
SOLAR CENTRAL RECEIVER HELIOSTAT MIRROR MODULE DEVELOPMENT Final Report
Robert B. Hubbs, Jr. May 1981 186 p refs
(Contract DE-AC04-76DP-00789)
(SAND-79-8189) Avail: NTIS HC A09/MF A01

The design, development, and fabrication of a low cost, mass producible heliostat mirror module are described. Structural, optical, and economic trade offs were evaluated in screening candidate materials and processes. A laminated sandwich design concept with minimum facing sheets and a polystyrene honeycomb core was selected for the baseline design. The Silver-Vestar spray process was selected for direct metallization of 5657-H25 aluminum sheet, as a first surface silvered reflector system. DOE

N81-31657# Sandia Labs., Livermore, Calif.
SELECTION AND CONCEPTUAL DESIGN OF AN ADVANCED THERMAL-ENERGY-STORAGE SUBSYSTEM FOR COMMERCIAL-SCALE (100 MWe) SOLAR CENTRAL-RECEIVER POWER PLANT
Feb. 1981 201 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-8190; BAW-1662) Avail: NTIS HC A10/MF A01

Advanced thermal energy storage concepts were developed and evaluated which are applicable to a 100 MWe solar central receiver plant using water/steam as the working fluid. Three concepts were selected that offered potential for cost and performance improvements over the oil/rock concepts. From the three concepts selected, the moving bed thermal energy storage system using a free flowing refractory material as the heat transport and storage media was chosen. A conceptual design was developed, including estimates for cost and performance. DOE

N81-31658# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
STORAGE IN RESIDENTIAL SOLAR TOTAL-ENERGY SYSTEMS
R. W. Leigh Dec. 1980 85 p refs
(Contract DE-AC02-76CH-00016)
(BNL-51230) Avail: NTIS HC A05/MF A01

The potential role of energy storage devices in solar total energy systems operating in a stand alone mode is examined. High temperature thermal storage is examined in the context of systems employing parabolic trough collectors and Rankine cycle conversion while batteries are evaluated in systems based on parabolic dish concentrators with Stirling cycle conversion or on nonconcentrating photovoltaic systems. In all three systems, storage was found to be advantageous in cases involving high future fuel prices and collectors meeting current cost goals, while storage was not found to be viable at fuel prices remaining near current levels and collector costs exceeding current expectations by substantial margins. Factors making storage more or less desirable are discussed. Throughout, analyses based on minimum cost (optimal) systems are employed. DOE

N81-31659# Ueland and Junker, Architects and Planners, Philadelphia, Pa.
SOLAR ATRIUM: A HYBRID SOLAR HEATING AND COOLING SYSTEM
Donald L. Larson May 1981 26 p Prepared in cooperation with Drexel Univ.
(Contracts DE-FG02-77CS-34135; EG-77-G-04-4135)
(DOE/CS-34135/T4) Avail: NTIS HC A03/MF A01

Solar atrium is a hybrid system of solar heating and cooling consisting of a central atrium space having a south wall aperture with movable insulating/shading louvers and a rock thermal storage unit in the basement. In addition, the atrium contains an open pool which serves as thermal mass and a source of humidity. Back up space heating and cooling is furnished by an air to air heat pump. Hot air is collected from the atrium ceiling and circulated by a fan through the rock bed and into the house duct system. A demonstration house in Philadelphia, Pennsylvania was designed, constructed, and monitored to test the concept. DOE

N81-31660# Colorado School of Mines, Golden. Research Inst.
STATE ENERGY MODELING. VOLUME 1: AN ANALYSIS OF STATE ENERGY MODELING
Albert G. Melcher 30 May 1981 85 p 2 Vol.
(Contract DE-AC02-79CS-10046)
(DOE/CS-10046/2-Vol-1) Avail: NTIS HC A05/MF A01

An inventory and analysis of state energy models were made. The inventory identified 69 models developed or used at the state government level. Most of these deal with energy demand and area mix as regards the sectors modeled and the fuel types included. Nearly all of these are econometric or econometric engineering end use models. Fewer models deal with energy supply, and several address both supply and demand. The most common types of models are econometric, engineering and use, linear programming, and input-output. Purposes of models include: forecasting; policy analysis; impact analysis; and scenario analysis. Uses include short term emergency management, long term strategic assessment, and specific applications in decisions on facility siting, utility capacity expansion and rate increases proposed legislation, and analysis of federal policy. DOE

N81-31661# Colorado School of Mines, Golden. Research Inst.
ENERGY MODELING. VOLUME 2: INVENTORY AND DETAILS OF STATE ENERGY MODELS
Albert G. Melcher, Robert G. Underwood, Joseph C. Weber, Ronald L. Gist, Roger P. Holman, and Dennis W. Donald 30 May 1981 295 p refs 2 Vol.
(DOE/CS-10046/2-Vol-2) Avail: NTIS HC A13/MF A01

An inventory of energy models developed by or for state governments is presented, and certain models are discussed in depth. These models address a variety of purposes such as: supply or demand of energy or of certain types of energy; emergency management of energy; and energy economics. Ten models are described. The purpose, use, and history of the model is discussed, and information is given on the outputs, inputs, and mathematical structure of the model. The models include five models dealing with energy demand, one of which is econometric and four of which are econometric-engineering end-use models. DOE

N81-31662# Systems Science and Software, La Jolla, Calif.
BACA GEOTHERMAL DEMONSTRATION PROJECT. EQUATION-OF-STATE FOR WATER-CARBON DIOXIDE MIXTURES: IMPLICATIONS FOR BACA RESERVOIR
J. W. Pritchett, M. H. Rice, and T. D. Riney Feb. 1981 57 p refs Prepared for Union Geothermal Co. of New Mexico and Public Service Co. of New Mexico

(Contract DE-FC03-78ET-27163)
(DOE/ET-27163/8) Avail: NTIS HC A04/MF A01

An equation of state package for water carbon dioxide mixtures was constructed. The thermodynamic state of the Baca reservoir fluid was examined for temperature, pressure and CO2 content for bracket conditions existing at the production depth of the wells in the Redondo Creek area. It is shown that the reservoir fluid may be either all liquid or two phase at various well locations and depths, depending on the CO2 content. It is also shown that the CO2 content at reservoir conditions cannot be reliably inferred from pressure/temperature measurements made on flowing wells. The equation of state package is incorporated into a general purpose geothermal reservoir simulator and calculations show that the CO2 content of the produced fluid is less than or greater than that of the reservoir fluid. The characteristics of the produced fluid are sensitive to the CO2 content in the reservoir. DOE

N81-31663# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SECOND-GENERATION HELIOSTAT DETAIL DESIGN REPORT
R. K. Knowles Aug. 1980 204 p
(Contract DE-AC04-76DP-00789)
(SAND-78-8192; MDC-G8631) Avail: NTIS HC A10/MF A01

The second generation heliostat design and a summary of the compliance of the design to the key heliostat requirements are reviewed. The heliostat hardware is described. The hardware and software design used to fulfill the requirements and the analysis and test used to evaluate related performance are presented. The technical feasibility and potential cost savings of a variety of automated mirror inspection techniques are assessed. DOE

N81-31664# Westinghouse Electric Corp., Concordville, Pa. Combustion Turbine Systems Div.
DEVELOPMENT AND VALIDATION OF RELIABILITY FORECAST TECHNIQUES FOR SELECTED THERMOMECHANICAL COMPONENTS OF GAS-TURBINE COMBINED-CYCLE PLANTS: GUIDELINES FOR MAKING RELIABILITY FORECASTS
R. E. Strong and K. H. Eagle May 1981 118 p
(EPRI Proj. 1188)
(EPRI-AP-1848) Avail: NTIS HC A06/MF A01

The reliability of thermomechanical components of gas turbine combined cycle plants were validated. The procedures cover identical or similar components used in the same or different applications. Data factors, methods and techniques used in the procedures are appended. The decision tree establishes the prediction procedure. DOE

N81-31665# Sandia Labs., Albuquerque, N. Mex.
COMMERCIALIZATION OF A PHOTOVOLTAIC CONCENTRATOR: ACUREX REPORT Final Report
J. Kull, G. Litzinger, B. Masters, and K. Yasuda Jul. 1981 167 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-7082; FR-80-11/AE) Avail: NTIS HC A08/MF A01

A development program is described that has produced a new photovoltaic (PV) concentrator and concentrator manufacturing facility. The new PV concentrator features active cooling and thermal energy recovery. Background information, a program description, key results, and recommendations for future work are provided. The concentrator design, operating experience, and production capability are described. The optical, electrical and mechanical considerations were addressed by evaluating various possible alternatives in engineering trade studies. Two receiver configurations selected based on study results are described. The performance of the new concentrator array was examined in a preliminary series of tests. DOE

N81-31666# Boeing Co., Seattle, Wash. Solar Heating and Cooling Demonstration Program Office.
WAVERLY HOMES, INC. (LOT 13) SINGLE FAMILY RESIDENCE, WESTMINSTER, COLORADO. SOLAR PROJECT DESCRIPTION
26 Mar. 1981 50 p
(Contract DE-AB01-76OS-31020)
(SOLAR/1022-81/50) Avail: NTIS HC A03/MF A01

The use of solar energy for space heating a single family home and preheating incoming city water is discussed. The system has an array of flat plate collectors with a gross area of 351 square feet. Air is used to deliver solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in the basement in a 175 cubic foot concrete tin containing 17,500 pounds of rock. Solar energy preheated city water is stored in an 80 gallon preheat storage tank and supplied, to a conventional 40 gallon domestic hot water (DHW) tank. When solar energy is insufficient to satisfy the space heating load, a gas furnace provides auxiliary energy for space heating. Similarly, a gas heater in the DHW tank provides auxiliary energy for water heating. DOE

N81-31667# Lockman and Associates, Monterey Park, Calif.
FEASIBILITY OF DIRECT ON-SITE CONVERSION OF LANDFILL GAS TO ELECTRICAL ENERGY AT SCHOLL CANYON LANDFILL, CALIFORNIA Final Report
Ronald J. Lofy Jun. 1981 55 p
(Contract DE-AC01-79CS-20237)
(DOE/CE-20237/1) Avail: NTIS HC A04/MF A01

The technical and economic feasibility of direct onsite conversion of landfill gas into electrical energy for distribution through the municipal company's distribution grid is described. The various approaches are evaluated. Each system looked at the preliminary collection system layout, type of processing, and conversion equipment required, conversion efficiencies, total system costs, total energy output per input landfill gas, and overall economic comparisons between alternatives. This led to the selection of the internal combustion engine. The legal constraints on interdepartmental transfers of money and resources, city procedures for coordination between the public works department and public services, procedures for facility operation, and an environmental assessment of each alternative were investigated. DOE

N81-31668# Science Applications, Inc., La Jolla, Calif.
COMPARISON OF CONVENTIONAL AND AND SOLAR-WATER-HEATING PRODUCTS AND INDUSTRIES REPORT
Darryl Noreen, Robert Lechevalier, Michael Choi, and Jeff Morehouse 11 Jul. 1980 299 p refs
(Contract DE-AC03-80CS-30217)
(DOE/CS-30217/T1) Avail: NTIS HC A13/MF A01

Issues are examined in the framework of the conventional-hot-water industry. Based on the results of this solar hot water assessment study, documented proof is presented to show that the solar industry possesses over 20 good solar hot water systems. A total of eight generic types are currently being produced, but a majority of the systems being sold are included in only five generic types. The good systems are well-packaged for quality, performance and installation ease. These leading systems are sized and designed to fit the requirements of the consumer in every respect. DOE

N81-31669# CALMAC Mfg. Co., Englewood, N. J.
SALT-HYDRATE THERMAL-ENERGY-STORAGE SYSTEM FOR SPACE HEATING AND AIR CONDITIONING Final Report, 1 Dec. 1977 - 30 Jun. 1980
Calvin D. MacCracken, John M. Armstrong, Mark M. MacCracken, and Brian M. Silvetti 1980 86 p refs
(Contracts DE-AC02-78CS-34698; EM-78-C-02-4698)
(DOE/CS-34698/T1) Avail: NTIS HC A05/MF A01

Latent heat storage equipment using three different salts was developed. The salts are: sodium sulfate pentahydrate which melts at 460 C, magnesium chloride hexahydrate which melts at 1150 C, and a eutectic combination of seven different materials which melts at 70 C. Stirring pumps, tanks, and tubing materials, and field filling of the salts into their tanks are developed. good performance for the tank/heat exchangers with all three salts is reported. Both the 1150 C and 460 C salts are almost equivalent in volume storage to water/ice. The 79.0 C salt, however, begins at about 56% of the BTU's per cubic foot of water/ice and declines due to separation to 40% after repeated cycling. DOE

N81-31670# Sandia Labs., Livermore, Calif. Large Power Systems Div.

SOLAR POWER TOWER DESIGN GUIDE: SOLAR THERMAL CENTRAL RECEIVER POWER SYSTEMS. A SOURCE OF ELECTRICITY AND/OR PROCESS HEAT

Kirk W. Battleson Apr. 1981 162 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-8005) Avail: NTIS HC A08/MF A01

Preliminary evaluations of whether a solar thermal central receiver plant is technically and economically feasible and desirable, for the potential user's application are reported. The cost elements, performance, and operation of solar central receiver systems are described. DOE

N81-31671# Battelle Inst., Frankfurt am Main (West Germany). Hauptabteilung Chemie.

SELF DISCHARGE OF CELLS WITH NEGATIVE ELECTRODES IN LITHIUM OR LITHIUM ALLOYS Final Report [FORSCHUNGS- UND ENTWICKLUNGSARBEITEN UEBER DIE SELBSTENTLADUNG VON ZELLEN MIT NEGATIVEN ELEKTRODEN AUS LITHIUM UND AUS EINER LITHIUM-LEGIERUNG]

Reinhard Knoedler, Gotthold Boehme, and Helga Heide Bonn Bundesministerium fuer Forschung und Technologie Jul. 1980 31 p ref In GERMAN Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-031; ISSN-0340-7608) Avail: NTIS HC A03/MF A01

Cells of the types LiAl/FeS, LiAl/FeS2, LiSi/FeS and Li2Si/FeS having a LiCl/KCl electrolyte were built and tested for self discharge. Such batteries are expected to yield high energy and power outputs. The self discharge rate of LiAl/FeS cells is shown to be smaller than 1% and to decrease during operation. It remains low after prolonged charging and decharging. Aeration is shown to strongly increase the discharge rate. The other cell types discharge markedly faster. The measured rates are confirmed by computations based on the measured electron conductivity. Author (ESA)

N81-31672# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

[ACTIVITIES REPORT ON AEROSPACE AND ENERGY RESEARCH] Annual Report, 1979 [JAHRESBERICHT 1979]

1980 165 p refs In GERMAN Original contains color illustrations
Avail: NTIS HC A08/MF A01

Research in the following areas is described: (1) transport and communication systems; (2) aircraft; (3) space flight techniques; (4) exploration techniques; (5) energy and drilling technology. Research facilities are described, inculding the German-Dutch wind tunnel, the European transonic cryogenic wind tunnel, and the Spacelab simulator. Author (ESA)

N81-31673# Ingenieurbuero, Bruehl (West Germany).

SOLAR ENERGY MODEL GOENNEBEK. DEVELOPMENT AND PLANNING OF A SELF-SUPPORTING HEATING PLANT FOR GREENHOUSES Final Report

Bernard Gerhards Bonn Bundesministerium fuer Forschung und Technologie Oct. 1980 133 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-80-119; ISSN-0340-7608) Avail: NTIS HC A07/MF A01

The recovery, storage, and saving of energy in greenhouses by application of solar energy is investigated. Self-sufficiency is sought by making use of long-term storage of summer heat. A pilot installation is described consisting of a greenhouse with air collector, a medium-term accumulator, a long-term water heat storage tank and a 1500 m square plane collector field. Detailed construction plans and data on energy requirements and costs are given. Full independence from fossil fuels of the greenhouse and adjacent auction hall and office space is demonstrated. Control and programming is performed by a process computer. The highly efficient heat insulation system is credited for most of the success. The present installation requires only 40% of the energy needs of a regular double glass greenhouse. Author (ESA)

N81-31674# New England Council of Water Center Directors, Boston, Mass.

WATER, ENERGY, AND ECONOMIC DEVELOPMENT TOWARDS AN INTEGRATED REGIONAL POLICY ANALYSIS SYSTEM: SELECTED BACKGROUND ESSAYS

Rudolph W. Hardy, ed. Dec. 1980 46 p refs
(Contract DI-14-34-0001-9412)
(PB81-184129; W81-02431;
OWRT-C-90071-G/C-00191-G9412-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Background essays for the project: water, energy, and economic development towards an integrated regional policy analysis system are reported. A write up for a preliminary systems dynamic model is included. The following topics are addressed: (1) planning theory; (2) institutional impacts of energy systems (the problem of scale); (3) regional incidence of investment and welfare; (4) innovation in the public sector; and (5) description of a preliminary model for the study of interactions among water, energy, and economic development. GRA

N81-31675# Institute for Telecommunication Sciences, Boulder, Colo.

ANALYSIS OF A PHASE-LOCKED LOOP TO SUPPRESS INTERFERENCE FROM A SOLAR POWER SATELLITE

J. R. Juroshek and F. G. Stewart Feb. 1981 24 p refs Sponsored in part by DOE
(PB81-193781; NTIA-Rept-81-63) Avail: NTIS HC A02/MF A01 CSCL 10B

Signal cancellation techniques are particularly suited to interference from the proposed solar-power satellite which would transmit a coherent, CW, microwave, power signal from a geosynchronous satellite. The analysis concludes that a phase-locked loop and associate AGC circuit could be used to generate a replica of the interfering signal which would then be subtracted from the composite signal. It is also concluded that signal suppression of the order of -30 dB should be possible with current technology. A brief analysis of a second-order, type-one, phase-locked loop is presented. GRA

N81-31676# Institute for Telecommunication Sciences, Boulder, Colo.

ANALYSIS OF INTERFERENCE CAUSED BY THE SOLAR POWER SATELLITE TO SATELLITE EARTH TERMINALS

John R. Juroshek Feb. 1981 44 p refs
(Contract DE-A101-80ER-10160)
(PB81-194268; NTIA-Rept-81-64) HC A03/MF A01 CSCL 10B

The solar power satellite (SPS) is a concept for generating electrical power from solar energy via a geosynchronous orbiting satellite. A facility, such as this, would be able to send approximately 5 to 10 gigawatts of power to Earth on a highly focused 2450 MHz microwave beam. The electromagnetic compatibility problems caused by this amount of microwave power transmission are recognized as a critical factor in the implementation of such a system. The potential for interference between SPS and conventional satellite earth terminals was examined. GRA

N81-31677# Institute for Telecommunication Sciences, Boulder, Colo.

ANALYSIS OF INTERFERENCE FROM THE SOLAR POWER SATELLITE TO GENERAL ELECTRONICS SYSTEMS

John R. Juroshek and Francis K. Steele Feb. 1981 38 p refs
(Contract DE-AI06-79RL-10077)
(PB81-194250; NTIA-Rept-81-65) Avail: NTIS HC A03/MF A01 CSCL 10B

The possibility of interference of conventional consumer electronic devices such as TV receivers, AM/FM stereo receivers, electronic calculators, and FM mobile receivers is considered. Also included are estimates of the field intensities that would be required to produce interference in three different types of integrated circuits. The report also examines the potential for interference to medical electronics devices, with specific emphasis on pacemakers and site security devices such as proximity detectors and security TV cameras. GRA

N81-31678# Commerce Dept., Boulder, Colo.

IMPACT OF SATELLITE POWER SYSTEMS ON THE

IONOSPHERE Final Summary Report
1980 103 p refs
(Contract DE-AI02-79CH-10003)
(DOE/CH-10003/1) Avail: NTIS HC A06/MF A01

The material presented is directed toward effects in the ionosphere resulting from heating induced by the passage of the SPS microwave beam. Some topics included are: telecommunication system studies in a simulated SPS environment, and theoretical and experimental studies of the physics of ionospheric heating. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N81-31679# National Advisory Committee on Oceans and Atmosphere, Washington, D.C.
A SPECIAL REPORT TO THE PRESIDENT AND CONGRESS: THE ROLE OF THE OCEAN IN A WASTE MANAGEMENT STRATEGY
Jan. 1981 130 p refs
Avail: NTIS HC A07/MF A01

The legislative history of the Federal Water Pollution Control Act (Clean Water Act) and the Marine Protection, Research, and Sanctuaries Act (the Ocean Dumping Act) as they have affected present regulations and practices concerning management of waste material in oceans and estuaries, is reviewed as well as other waste management legislation that may indirectly impact on ocean disposal practices. The known effects of ocean disposal of three types of material: sewage sludge, industrial waste, and dredged material are examined. The National Advisory Committee on Ocean's and Atmosphere's recommendations on what course of action the nation needs to pursue in reexamining present national policies and regulations concerning waste disposal in the ocean are summarized. Because a return to indiscriminate use of the ocean as the waste disposal medium of choice would be a mistake, the Committee encourages more emphasis at the Federal level on reuse and recycling of wastes. A.R.H.

N81-31680*# Science Applications, Inc., La Jolla, Calif.
SATELLITE MEASUREMENTS OF TROPOSPHERIC AEROSOLS Final Report
M. Griggs Aug. 1981 64 p refs
(NASA-CR-3459; SAI-131-80-578-LJ) Avail: NTIS HC A04/MF A01 CSCL 13B

This investigation uses LANDSAT 2 radiance data and ground-truth measurements of the aerosol optical thickness, obtained previously from five inland sites, to study the usefulness and limitations of the near infrared radiance over inland bodies of water. The linear relationship between LANDSAT 2 MSS7 and aerosol content found in this study can be used to estimate the aerosol content with a standard deviation of 0.42N. Analysis of the data for MSS6 and MSS7 suggest that the larger uncertainty is mostly due to water turbidity, with little contribution from the adjacency effect. The relationship found is best applied to determine an average aerosol content over a period of time at a given target, or an area average at a given time over several targets close together. Author

N81-31681# California Univ., Irvine.
THE 11TH CONFERENCE ON ENVIRONMENTAL TOXICOLOGY
Wright-Patterson AFB, Ohio AFAMRL Jun. 1981 411 p refs Conf. held at Dayton, Ohio, 19-20 Nov. 1980
(Contract F33615-80-C-0512; AF Proj. 6302)
(AD-A102259; AFAMRL-TR-80-125) Avail: NTIS HC A01/MF A01 CSCL 06/20

Subjects of presentations and discussions included behavioral consequences of exposure to occupational environments, development of emphysema after exposure to chemicals, epidemiology of industrial solvents and genetic factors in susceptibility to environmental agents. The toxic effects of specific fuels and chemicals used by the Armed Forces were also discussed. Author (GRA)

N81-31682# California Univ., Livermore. Lawrence Livermore Lab.
HIERARCHICAL SET OF MODELS FOR ESTIMATING THE EFFECTS OF AIR POLLUTION ON VEGETATION
J. R. Kercher, M. C. Axelrod, and G. E. Bingham 26 May 1981 34 p refs Presented at the Intern. Symp. on Energy and Ecological Modelling, Louisville, Ky., 20-24 Apr. 1981
(Contracts W-7405-eng-48; FWS-14-16-009-78-969)
(UCRL-85367; CONF-810488-1) Avail: NTIS HC A03/MF A01

Three models were developed: the photosynthetic process (PHOTO), plant (GROW1), and community (SILVA) levels of resolution. PHOTO simulates the enhancement of photosynthesis at low H2S levels, depression of photosynthesis at high H2S levels, and the thresholds effects for sulfur pollutants. GROW1 simulates the growth and development of a plant during a growing season. GROW1 was used to assess the effects on sugar beets of geothermal energy development in the Imperial Valley, California. SILVA is a community level model simulating the effects of SO2 on growth, species composition, and succession, for the mixed conifer forest types of the Sierra Nevada, California. DOE

N81-31683# Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
DISTRICT HEATING: AIR-QUALITY CONSIDERATIONS AND THE CLEAN AIR ACT
P. D. Moskowitz, T. Carney, and F. W. Lipfert Jan. 1981 24 p refs
(Contract DE-AC02-76CH-00016)
(BNL-51361) Avail: NTIS HC A02/MF A01

The advantages of a district heating facility arise from increases in overall energy utilization efficiency and the ability to use coal or nuclear fuels as energy sources and thus reduce dependence on more limited energy resources such as oil or natural gas. It is suggested that commercialization of the district heating concept is likely to reduce regional production of environmental residuals, even though local burdens could increase. Although site specific production of emissions could increase, it is shown that local air quality will not be degraded. It is concluded that although air quality benefits could be accrued nonattainment requirements of the Clean Air Act may present a barrier to implementation. DOE

N81-31684# Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology.
VERTEBRATE BEHAVIOR AND ECOLOGY Progress Report, 1 Jun. 1980 - 31 May 1981
John R. Tester and Donald B. Siniff Jun. 1981 188 p refs
(Contract DE-AC02-76EV-01332)
(DOE/EV-01332/T1; COO-1332-132) Avail: NTIS HC A09/MF A01

This report details progress on two subprojects: engineering design and development; and ecological aspects of sea otters, grouse and fish. Engineering design and development focused on the refinement and adaptation of existing technology. This included the design of two types of implantable transmitters, the development of a more efficient sonic tag, the development of a computer compatable data recorder, and the support of ongoing projects. This recorder is designed to take data of a general nature, record it on cassette tape, allow the user to examine the data in the field and then transfer it to any general purpose computer for data analysis. Field efforts presented under Subproject II resulted in further information on activity patterns, movements and feeding behavior of sea otters in Alaska. California sea otter activity patterns were found to be highly variable among individuals and within an individual over time. A catalogue of sea otter behavior was developed and analyzed. DOE

N81-31685# Aerospace Corp., Germantown, Md.
OIL SHALE SURFACE RETORTING: ENVIRONMENTAL CHARACTERIZATION INFORMATION REPORT
Jan. 1981 68 p refs
(Contract DE-AT03-76EV-74010)
(DOE/EP-0015) Avail: NTIS HC A04/MF A01

Environmental Characterization Information Report for Oil Shale, Surface Retorting: Paraho Process (Direct Mode) is described. The plant chose for characterization is a syncrude

equivalent facility using the Paraho Process (Direct Mode). The process, assumed plant operating parameters, resources needed, and the environmental residuals and products associated with the plant are presented. Annual resource usage and pollutant discharges are shown in English and metric units, assuming an annual plant capacity factor of 90 percent. Twenty-one environmental points of interest are discussed individually. DOE

N81-31686# Stanford Univ., Calif. Dept. of Statistics.
MODELING AND ANALYSIS OF AIR-QUALITY DATA
Cyril D. Grivet Sep. 1980 175 p refs
(Contract DE-AC02-80EV-10428)
(DOE/EV-10428/8; TR-43) Avail: NTIS HC A08/MF A01

Air pollution is monitored in the San Francisco Bay Area at some 30 stations. The manner in which these data are summarized and reported is appropriate for comparisons with are quality standards. The representativity of the air pollution data and the validity of certain statistical procedures used to process these data, are analyzed. Oxidant concentrations during the months of July and August were used as the data base. The statistical interplay between pollution and weather is examined. The problem of spatial interpolation of pollution levels is approached using linear regression, partial correlations and kriging. Mathematical models are developed to test the validity of the assumption that there is not much difference between the use of overlapping versus nonoverlapping hourly averages of oxidant concentrations. DOE

N81-31687# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Environmental Transport Div.
DISPERSION OF RADIOACTIVE POLLUTANT IN A TORNADIC STORM
Darrell W. Pepper May 1981 102 p refs
(Contract DE-AC09-76SR-00001)
(DP-1556) Avail: NTIS HC A06/MF A01

A three-dimensional numerical model is used to calculate ground-level air concentration and deposition (due to precipitation scavenging) after a hypothetical tornado strike at a plutonium fabrication facility in Pennsylvania. The rotational characteristics of the tornadic storm are embedded within the larger mesoscale flow of the storm system. The design-basis translational wind values are based on probabilities associated with existing records of tornado strikes in the vicinity of the plant site. The quasi-Lagrangian method of moments is used to model the transport of concentration within a grid cell volume. In all case studies, the effects of updrafts and downdrafts, coupled with scavenging of the particulates by precipitation, account for most of the material being deposited within 20 to 45 km downwind of the plant site. Most of the material is deposited behind and slightly to the left of the centerline trajectory of the storm. DOE

N81-31688# Stockholm Univ. (Sweden). Dept. of Meteorology.
ESTIMATED CONTRIBUTIONS OF SWEDISH AND OUTSIDE SOURCES TO BACKGROUND AEROSOL CONCENTRATIONS IN SWEDEN
Roderick W. Shaw (Environmental Protection Service, Dartmouth, Nova Scotia) 5 Feb. 1981 35 p refs
(CM-50) Avail: NTIS HC A03/MF A01

A simple atmospheric dispersion model was applied to Swedish and Finnish sources of sulfur, vanadium, nickel, iron, manganese and lead in background atmospheric aerosols measured in the absence of precipitation at Velen, a rural site in south-central Sweden. For atmospheric flow from the northeast gradient, the measured concentrations could be accounted for by Swedish and Finnish sources, within a factor of plus or minus two. For atmospheric flow with a southerly component, however, a substantial fraction (from 50 to 90%) of the measured concentrations cannot be accounted for by Swedish sources. Even allowing for the uncertainties in measurement and the dispersion calculations, it appears that sources outside Sweden have a substantial influence on background concentrations of the above six substances. Author (ESA)

N81-31689# Stockholm Univ. (Sweden). Dept. of Meteorology.
CHANGING GLOBAL BIOGEOCHEMISTRY
Bert Bolin 19 Feb. 1981 38 p refs Submitted for publication
(CM-52) Avail: NTIS HC A03/MF A01

Key problems for a better understanding of the global biogeochemical cycles are discussed. It is suggested that in modelling the role of terrestrial biomes for the global biogeochemical interplay more attention should be given to interactions between biomes in addition to study of processes on the microscale such as photosynthesis and microbial activity in the soil. Man's impact on terrestrial biomes can be assessed by the proper determination of characteristic response functions of the major biomes and particularly its dependence on gross environmental factors such as climate. Data from the GEOSECS Project provide a basis for the development of more advanced models that describe the interaction of ocean circulation and transfer and the biology and chemistry of the sea. The role of the Antarctic Ocean for the air-sea exchange of radiocarbon is reanalyzed and it follows that the characteristic turnover time of the deep sea both in the Atlantic and Pacific oceans as determined from the radiocarbon distribution in deep waters is less than most previous ocean circulation models have yielded. Author (ESA)

N81-31690# SRI International Corp., Menlo Park, Calif.
DEVELOPMENT OF MEASUREMENT METHODOLOGY FOR, EVALUATING FUGITIVE PARTICULATE EMISSIONS
Edward E. Uthe, John M. Livingston, Clyde L. Witham, and Norman B. Nielsen May 1981 71 p refs
(Contract EPA-68-02-2752)
(PB81-196594; EPA-600/2-81-070) Avail: NTIS HC A04/MF A01 CSCL 13B

The project focused on the application of the lidar (laser radar) technique under field conditions, but in circumstances that simplified and controlled the variables of the general problem. The lidar was used to make elevation scans perpendicular to an aerosol plume generated by controlled release of particulate material into the atmosphere. The lidar backscatter and these values were related to independently measured paticulate emission rates. Very high correlation was obtained between time-averaged lidar observations and emission rates (correlation coefficients of 0.9 or better in most runs), with substantially less correlation for individual lidar observatons. Relatively high correlation also was obtained between smoke reader data (opacity) with smoke emission rate and with lidar backscatter. GRA

N81-31691# Jacobs Engineering Co., Pasadena, Calif.
ENVIRONMENTAL PERSPECTIVE ON THE EMERGING OIL SHALE INDUSTRY. VOLUME 2: APPENDICES
Edward R. Bates, ed. and Terry L. Thoem, ed. Denver EPA Apr. 1981 442 p refs
(Contract EPA-68-03-2569)
(PB81-196602; EPA-600/2-80-205B) Avail: NTIS HC A19/MF A01 CSCL 13B

The following appendices are included: status and development of the oil shale industry; procedures for ambient air monitoring; environmental monitoring activities; applicable Federal, state and local legislation, standards and regulations; quality assurance bibliography; Federal and state permits required for operation of an oil shale facility. GRA

N81-31692# Pennsylvania State Univ., University Park.
FIELD TESTS OF INDUSTRIAL STOKER COAL-FIRED BOILERS FOR EMISSIONS CONTROL AND EFFICIENCY IMPROVEMENT, SITES L1-L7 Final Report, Feb. 1978 - May 1979
J. W. Davis and H. K. Owens Feb. 1981 67 p Sponsored in part by the American Boiler Manufacturers Assn.
(Contracts EPA-IAG-D7-E681FZ; DOE-EF-77-C-01-2609)
(PB81-196628; EPA-600/7-81-020A) Avail: NTIS HC A04/MF A01 CSCL 13B

Results of field measurements to determine particulate emission rate and particle size distribution for seven institutional type stoker fired boilers firing bituminous coals are given. Operational data were recorded during the tests to provide information for evaluating boiler emission as a function of boiler load, heat release rates, coal size and characteristics, percent excess combustion air, and flue gas temperature. All boilers were tested under normal operating conditions at loads of 50-75 percent of maximum boiler capacity. The types of stokers tested included

single retort underfeed, multiple retort underfeed, traveling grate overfeed, and vibrating grate overfeed. GRA

N81-31693# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
TRACE ORGANICS REMOVAL USING ACTIVATED CARBON AND POLYMERIC ADSORBENTS Final Report, Jun. 1976 - May 1980
Charles Oulman May 1981 53 p refs Prepared in cooperation with American Water Works Association Research Foundation (Grant EPA-R-804433)
(PB81-196784; EPA-600/2-81-079) Avail: NTIS HC A04/MF A01 CSCL 13B

A survey of trace organic matter in 14 water supplies was conducted to determine monthly concentrations of trihalomethanes and TOC, as well as the occurrence of selected organic compounds listed in the Federal Register and mutagenicity. Most of the water supplies tested should be able to meet trace organics requirements with conventional treatment methods. Bench scale tests were conducted to select a granular activated carbon and a polymeric adsorbent for side-by-side comparison in a pilot plant. The pilot plant tests demonstrated that the kinds of granular activated carbon that are used in water supply applications are capable of removing organic matter covering a wide range of molecular weights. The polymeric resins were much more limited in the range of organic matter they would remove. GRA

N81-31694# Rensselaer Polytechnic Inst., Troy, N. Y. Lab. for Computer Methods in Large Scale Systems.
A DYNAMIC MODEL OF THE URBAN PROCESS Final Report
Pitu Mirchandani, F. Imbrogano, and N. Faris Mar. 1981 199 p refs
(Contract DOT-RC-82016)
(PB81-196990; TRS-8001) Avail: NTIS HC A09/MF A01 CSCL 13B

The report examined the dynamics of the various components of the urban process. The interactions among the components, were also examined and deductively represented to obtain a large scale model framework of the urban process. Specifically, three major functional components are modeled: trip behavior, where the trip taking (both, for work and non-work trips) behavior is modeled; residential locational decisions, residential choices and movement of workers are conceptualized; and service location decisions, where the normative decision-making of entrepreneurs and agencies is represented. GRA

N81-31695# Environmental Sciences Research Lab., Research Triangle Park, N.C.
FILTER MEDIA FOR COLLECTING DIESEL PARTICULATE MATTER
Frank Black and Lisa Doberstein May 1981 37 p refs
(PB81-197774; EPA-600/2-81-017) Avail: NTIS HC A03/MF A01 CSCL 13B

Certification of particulate emissions from diesel motor vehicles involves filtration of measured aliquots of the total air diluted exhaust. Seven commercially available filter media were examined for this purpose. The media included a variety of PTFE membrane filters, glass fiber filters, and PTFE coated glass fiber filters. Relative flow resistance (pressure drop), collection efficiency, and gas phase adsorption were examined. The results obtained indicate that under the defined test conditions the membrane filters yield low gram per mile emissions rates due to difficulties with collection of Federal Test Procedure phase 1 emissions, and the Gelman A-E glass fiber filter high rates due to adsorption of gas phase emissions. GRA

N81-31696# Battelle Columbus Labs., Ohio.
EVALUATION OF EMISSIONS AND CONTROL TECHNOLOGY FOR INDUSTRIAL STOKER BOILERS Final Report, Oct. 1977 - Oct. 1980
Robert D. Giammar, Russell H. Barnes, David R. Hopper, Paul R. Webb, and Albert E. Weller May 1981 266 p refs
(Contract EPA-68-02-2627)
(PB81-197873; EPA-600/7-81-090; IERL-RTP-1187) Avail: NTIS HC A11/MF A01 CSCL 13B

Emission characteristics were determined for a variety of coals fired in a 200-kW stoker boiler. It was observed that significant amounts of sulfur were retained in the lignite and western subbituminous coals. Fuel nitrogen conversion to NO was found to be between 10 and 20%. In addition, a limestone/coal fuel pellet was developed and found effective in capturing 80% of the fuel sulfur. Using an 8-MW spreader stoker boiler, it was found that improved control of combustion air (i.e., underfire and overfire air) resulted in lower excess air operation (improved efficiency), reduced particular loading, smoke, CO and NO emissions and no effect on SO2 levels. The limestone/coal pellet (Ca/S = 7) was successfully fired, achieving 75% SO2 reduction. GRA

N81-31697# Missouri Univ. -Columbia. Dept. of Chemistry.
INTERCHANGE OF POLLUTANTS BETWEEN GROUNDWATER AND AND MINERAL STRATA AS APPLIED TO WASTE CHEMICAL DUMPS AND IN SITU COAL GASIFICATION SITES Completion Report, 1 Oct. 1979 - 30 Sep. 1980
Stanley E. Manahan, Paul Tobben, Robert Gale, Steven Hoeffner, and Darryl Bornhop 15 Mar. 1981 19 p refs
(Contract DI-14-34-0001-0127)
(PB81-198335; W81-02714; OWRT-A-117-MO(1)) Avail: NTIS HC A02/MF A01 CSCL 13B

Particular emphasis was placed upon the development of methods to evaluate the chemical interaction between contaminated groundwaters and specific solids so that these methods could be applied to specific situations which other investigators might need to study. Of particular importance was the development of methods to obtain chemical data which in turn can be used to provide meaningful bases for modelling groundwater contamination. Water contaminated by vapor from laboratory-simulated in situ coal gasification was employed as a model polluted water. The solids used to sorb organics from this waster were subbituminous coal, non-activated coal char, activated coal char, and coal ash. GRA

N81-31698# Texas A&M Univ., College Station. Texas Water Resources Inst.
SURVEY AND CONTROL OF SYNTHETIC ORGANICS IN TEXAS WATER SUPPLIES
Bill Batchelor, Joe Dan Shannon, and Peder Yang Jan. 1981 167 p refs
(Contracts DI-14-34-0001-9046; DI-14-34-0001-0146)
(PB81-198384; TR-109; W81-02719; OWRT-A-047-TEX(1))
Avail: NTIS HC A08/MF A01 CSCL 13B

Four Texas water supplies (Lakes Somerville and Livingston, and the Neches and Sabine Rivers) were surveyed to determine their tendency to form trihalomethanes (THM) when chlorinated. Conventional alum coagulation (CAC) was studied in a series of jar tests; effect of pH and alum dose was determined for removal of THM formation potential (THMFP), UV-absorbance, total organic carbon, and visible-absorbance. The latter was used as a surrogate for turbidity. Modification of CAC (addition of acid or base, or of secondary coagulants) was studied; a medium molecular weight cationic polymer and activated silica were used with alum and as sole coagulants. An innovative treatment process for removal of THMFP was also investigated. GRA

N81-31699# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards
GUIDELINE FOR APPLYING THE THE AIRSHED MODEL TO URBAN AREAS
Oct. 1980 174 p refs
(PB81-200529; EPA-450/4-80-020) Avail: NTIS HC A01/MF A01 CSCL 13B

The capabilites of the Airshed Model, its data requirements, and its application to control strategy analyses are discussed. The Airshed Model is an urban-scale, grid-based, photochemical dispersion model. Its greatest utility lies in studying the relationship of emissions of volatile organic compounds and nitrogen oxides to ambient ozone levels observed in major metropolitan areas. However, the model may be used to estimate ambient short-term concentrations of nitrogen dioxide and carbon monoxide as well. The guideline should enable air pollution control agencies and others to carry out the planning activities and to evaluate the level of resources needed to apply the model. GRA

N81-31700# Environmental Protection Agency, Washington, D.C. Office of Research and Development.
CONTROLLING SULFUR OXIDES
Aug. 1980 31 p refs
(PB81-200800; EPA-600/8-80-029) Avail: NTIS HC A03/MF A01 CSCL 13B

Most of the sulfur oxides which will be emitted over the next two decades will come from plants existing today. The successful control technoloies, especially those which can reduce emissions from existing plants are described. The adverse health and environmental effects of the troublesome sulfur oxides can be significantly reduced if these technologies are utilized. GRA

N81-31701# Massachusetts Univ., Amherst. Water Resources Research Center.
COST EFFECTIVE STREAM AND EFFLUENT MONITORING
Donald Dean Adrian, Cleve E. Willis, Charles E. Carver, James W. Male, Christopher C. Clarkson, Franklin S. Tirsch, Kevin Moore, and Donald R. Ryan Sep. 1980 107 p refs
(Contract DI-14-34-0001-7162)
(PB81-202210; PUB-118; W81-02901; OWRT-B-054-MASS(3)) Avail: NTIS HC A06/MF A01 CSCL 13B

The location of sampling stations is a critical factor in the design of a water quality monitoring network in a river basin. There are three levels of design criteria associated with sampling station location. They are: the macrolocation--river reaches which will be sampled within the river basin, the microlocation-station location relative to outfalls or other unique features within a river reach, and representative locations--points in the river's cross section from which grab samples will provide a lateral profile of the stream. The determination of macrolocations and representative locations is addressed. In addition, economic aspects of monitoring are considered so that the costs and benefits associated with a monitoring design can be used to determine the optimal level of monitoring. GRA

N81-31702# Radian Corp., Austin, Tex.
EVALUATION OF MAINTENANCE FOR FUGITIVE VOC EMISSION CONTROL Final Report
G. J. Langley and R. G. Wetherold May 1981 243 p refs
(Contract EPA-68-03-2776)
(PB81-206005; EPA-600/2-81-080) Avail: NTIS HC A11/MF A01 CSCL 13B

'Fugitive emissions' generally refers to the diffuse release of vaporized hydrocarbon or other organic compounds. Fugitive emissions originate from equipment leaks as well as large and/or diffuse sources. The project was designed to quantify the effectiveness of routine (on-line) maintenance in the reduction of fugitive VOC emissions from in-line valves. An overall emission reduction of approximately 70% was achieved by tightening the bolts on the valve packing gland. This level of control was sustained for up to about six months. The rates of leak occurrence and recurrence were also evaluated, as well as the time required to conduct the one-line maintenance. GRA

N81-31703# Missouri Univ. -Rolla. Graduate Center for Cloud Physics Research.
THE MEASUREMENT AND IDENTIFICATION OF ULTRAFINE AEROSOLS IN POLLUTED AIR Final Report, Jun. 1978 - Jun. 1979
J. Podzimek, J. C. Carsten, and P. C. Yue Mar. 1981 169 p refs
(Contract DOT-RC-82009)
(PB81-198673; AG-10; DOT-RSPA-DPB-50-81-13) Avail: NTIS HC A08/MF A01 CSCL 14B

The UMR-Absolute Aitken Nuclei counter (UMR-AAN) was compared with the following relative counters: the N-P counter, the General Electric (GE) automatic counter, and the Gardner counter (GA). The UMR-AAN counter exhibited consistently higher counts than the others. The mean deviations (calculated for AN concentration ranges from 300 to 20,000/CC) varied between 20 and 50% depending on the type of counter and the nature and concentration of the test aerosol (NaCl, (NH4)2SO4, Ni-Cr wire, carbon and room air). Several observations are made concerning the generation and storage of the test aerosol, as well as on ultrafine particle counting. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N81-31704 Wisconsin Univ. - Madison.
NORMAL MODE GLOBAL ROSSBY WAVES: THEORY AND OBSERVATIONS Ph.D. Thesis
Jon Elling Ahlquist 1981 104 p
Avail: Univ. Microfilms Order No. 8112526

Normal modes of linearized global primitive shallow water equations were found given a basic state of latitudinally dependent steady zonal flow. The solutions are free Rossby and gravity waves. Many of the waves' north-south structures are similar to Hough functions, which are the solutions of the simpler problem of free waves in an atmosphere at rest. The weak sensitivity of the solutions to the presence of a moving basic state is explained by a scale analysis of the dynamical equations. Four numerical methods were used to find the normal modes mentioned above. Two spectral procedures, namely the collocation and Galerkin methods, were definitely superior to two finite difference methods. Dissert. Abstr.

N81-31705 Rice Univ., Houston, Tex.
INTERPRETING ELECTRON TEMPERATURE CHANGES IN THE LOWER IONOSPHERE Ph.D. Thesis
David Stephen Coco 1981 199 p
Avail: Univ. Microfilms Order No. 8116948

The electron temperature changes due to 3, 5 and and 430 MHz radio wave heating in the lower ionosphere are measured using incoherent scatter diagnostic techniques and are also calculated from heating/cooling theory. In order to interpret the incoherent scatter results a spectral parameter library is developed which gives the spectral width, the spectral maximum and the bandlimited power of the incoherent scatter spectrum for a wide range of ionospheric parameters. A large discrepancy is found throughout the D and E regions: the measured electron temperature changes are much less than predicted. The discrepancy in the 75-100 km region removed by increasing the model 02 rotational cooling rate by a factor of 10, while the discrepancy below 75 km is removed by a factor of 4 increase. Dissert. Abstr.

N81-31706 Stanford Univ., Calif.
LITHOSPHERIC STRUCTURE OF THE EASTERN SNAKE RIVER PLAIN, IDAHO Ph.D. Thesis
Roger Weir Greensfelder 1981 197 p
Avail: Univ. Microfilms Order No. 8115793

The compressional and shear wave velocity structure of the eastern Snake River Plain is derived from data of seismic refraction and Rayleigh-wave phase velocities. The crust is 41 km thick and has very unusual structure: the depth interval 8-20 km has Vp and VS of 6.54 and 3.87 km/s, respectively; the lower crust (20-41 km) has VP and VS of 6.82 and 3.61 km/s, giving a Poisson's ratio of 31. The upper mantle has VP approximately 7.9 - 80 km/s and VS approximately 4.1 - 4.2 km/s, and a lid for shear waves appears to be either absent or very weakly developed. Teleseismic P- and S- wave delays, as well as gravity modelling, support this interpretation. These results are interpreted considering laboratory measurements of elastic velocities, regional geophysics (seismic velocity structure, heat flow, gravity, an magnetotellurics) and geology (including volcanic history and composition of deep crustal xenoliths). It is concluded that the plain is a major volcanic rift-graben, which has subsided about 6-7 km and may have experienced lateral extension of some 20-30%. Dissert. Abstr.

N81-31707 Stanford Univ., Calif.
KILAUEA VOLCANO, HAWAII: CHRONOLOGY AND MORPHOLOGY OF THE SURFICIAL LAVA FLOWS Ph.D. Thesis
Robin Terry Holcomb 1981 383 p
Avail: Univ. Microfilms order No. 8115797

Long-term variations in eruptive behavior occurred as Kilauea's present surface formed: these variations are revealed by geologic

mapping, dating; and morphologic analysis of lava flows. The chronology is based on the secular variation of the geomagnetic field, reconstructed from paleomagnetic measurements of lava flows dated by 14C. Key flows of unknown age are dated by comparison with the history of variation, and relative ages of other flows are determined from superposition and vegetation development. About 70 percent of Kilauea's surface is younger than 500 years, about 90 percent younger than 1000 years. Behavior of prehistoric eruptions is revealed by the morphology of their products. Eruptions are classified on the basis of duration, which is expressed in the degree of channelization achieved by lava flows. Dissert. Abstr.

N81-31708 Johns Hopkins Univ., Baltimore, Md.
THE ELECTRICAL CONDUCTIVITY OF THE EARTH'S UPPER MANTLE AS ESTIMATED FROM SATELLITE MEASURED MAGNETIC FIELD VARIATIONS Ph.D. Thesis
Edna Mary Didwall 1981 178 p
Avail: Univ. Microfilms Order No. 8115705

The electrical conductivity of the upper mantle is estimated from low lattitude magnetic field variations (magnetic storms) caused by large fluctuations in the equatorial ring current. The data base is derived from satellite magnetic field measurements. The disturbance field was separated into internal and external parts relative to the surface of the earth, and a response function which relates the internally generated magnetic field variations to the external variations due to the ring current was estimated. The estimated response function was interpreted using theoretical response functions for known conductivity profiles. Special consideration is given to possible ocean effects. A temperature profile reasonable for depths below 150-200 km is proposed, using conductivity temperature data for single crystal olivine. Dissert. Abstr.

N81-31709 California Univ., Berkeley.
ANALYSIS OF LOCAL VARIATIONS IN FREE FIELD SEISMIC GROUND MOTION Ph.D. Thesis
Jian-Chu Chen 1980 263 p
Avail: Univ. Microfilms Order No. 8112987

Ground motions are due to a complicated system of body waves and surface waves. However, it is usually assumed that near-surface motions consist only of vertically propagating waves. In order to examine the validity of this assumption for engineering design a theoretical investigation was made into the nature of near-surface motions produced by horizontally propagating waves. These include inclined P-, SV-, and SH-waves, Rayleigh waves and Love waves in horizontally layered sites over a viscoelastic half space. The research involves five phases; review of current knowledge, development of a new method of site response analysis, application to site response analysis, application to soil-structure interaction analysis and evaluation of the relative importance of horizontally propagating waves in engineering design. Dissert. Abstr.

N81-31710 Wisconsin Univ. - Madison.
A NUMERICAL MODEL STUDY OF LONG-TERM PLANETARY WAVE PREDICTABILITY Ph.D. Thesis
Richard Lee Wobus 1981 210 p
Avail: Univ. Microfilms Order No. 8112574

A model was developed and used to study planetary-wave behavior over periods up to four months under the influences of stochastic and diffusive forcing by synoptic-scale motions and of sea-surface temperature anomalies. The model is suitable for Monte Carlo experiments which provide ensemble mean and variance predictions and permit the response to heating anomalies to be partly separated from random variability. The model incorporates the linear-balanced dynamical equations for wind at two tropospheric levels and temperature at one level. These variables are represented over the Northern Hemisphere by spherical harmonics truncated at global wavenumber 8. The model atmosphere is forced by semi-empirical January heating linearly dependent on local air temperature. Topography and the lower boundary layer are represented by vertical motion and drag functions, respectively, of the lower level wind. The linear phase speeds of Rossby waves were modified to reflect the effect of the stratosphere. Dissert. Abstr.

N81-31711 Rice Univ., Houston, Tex.
ORIGIN DISTRIBUTION AND ALTERATION OF ORGANIC MATTER AND GENERATION AND MIGRATION OF HYDROCARBONS IN AUSTIN CHALK, UPPER CRETACEOUS, SOUTHEASTERN TEXAS Ph.D. Thesis
George Joseph Grabowski, Jr. 1981 295 p
Avail: Univ. Microfilms Order No. 8116961

The Austin Chalk is an impure onshore chalk that was deposited on a ramp marginal to the Gulf of Mexico during the Late Cretaceous. Basinal chalks are organic rich, commonly containing 0.5-5.0% amorphous, sapropelic kerogen derived from marine organic matter with only trace amounts of terrestial kerogen. Less organic matter was deposited and perserved in oxygenenated shallow water, and fresh-water diagenesis oxidized the organic matter on outcrop. In each sample, the kerogen is concentrated in microstylolites, with organic fluids segregated in micropores in the chalk. Dissert. Abstr.

N81-31712 West Virginia Univ., Morgantown.
CROSS-STRIKE STRUCTURAL DISCONTINUITIES-TEAR FAULTS AND TRANSFER ZONES IN THE CENTRAL APPALACHIANS OF WEST VIRGINIA Ph.D. Thesis
Thomas Hornor Wilson 1980 265 p
Avail: Univ. Microfilms Order No. 8115290

The structural characteristics of two cross-strike structural discontinuities (CSD's) in the central sedimentary Appalachians of West Virginia and Virginia were examined using limited field studies, structural cross sections, and gravity modeling. Detailed mapping and joint intensity studies were confined to the Valley and Ridge Middle Mountain syncline and adjacent Elkhorn Mountain anticline in Pendleton County, West Virginia where these structures are intersected by an extension of the Parson CSD. A gravity profile across these structures was also surveyed and modelled. Two structural cross sections were constructed across the sedimentary Appalachians to compare structural features north and south along the length of the Parsons CSD. Additional cross sections north or both the Parsons and Peterburg CSD's along with a longitudinal section across both these CSD's were constructed to provide additional details on subsurface Valley and Ridge structure in West Virginia. Comparisons of the theoretical gravity with already existing observed gravity data were made along these and other previously published structural sections through the area. Dissert. Abstr.

N81-31713 Princeton Univ., N. J.
PORE-FILLING CEMENTS IN TURBIDITES; SOUTHERN CALIFORNIA: PRODUCTS OF EARLY DIAGENESIS AND DEWATERING OF SHALE Ph.D. Thesis
Lee Franklin Krystinik 1981 161 p
Avail: Univ. Microfilms Order No. 8116539

Cementation of deep sea fan deposits which begins at the sediment water interface and continues progressively to the maximum depths was studied. The type and intensity of cementation is determined, in part, by the labile components within the system. Authigenic iron-rich smectite (AIRS) is the earliest cement in deep sea sediment. Formation of AIRS begins with the dissolution of biogenic silica. The Stevens sand provides insight into the early stages of graywacke formation. A significant volume of nondetrital, nonpseudomatrix clay is generated by precipitation of dissolved species carried into a sandstone body by waters expelled from adjacent shale. The Stevens also provides insight into turbidite sedimentation within a restricted basin supplied by several sediment sources. Most Cenozoic turbidities from southern California contain either calcite cement which occludes porosity and preserves the initial character of the sediment, or a silica clay cement which reduces porosity slightly, but occludes permeability. Cementation of sandstones by clays precipitated from pore fluids generated in adjacent shales may be a first step toward the genesis of graywacke. Dissert. Abstr.

N81-31714 California Univ., San Diego.
STRUCTURAL CHEMISTRY OF THE MARINE MANGANATE MINERALS Ph.D. Thesis
Stephen Ernest Crane 1981 311 p
Avail. Univ. Microfilms Order No. 8116824

Minerals which possess remarkable ion exchange properties, and play a significant role in the geochemical cycles of a number of metals were studied. X-ray absorption spectroscopy (XAS)

and laboratory ion exchange techniques were used to study the active sites for cation exchange in several natural manganates and their proposed synthetic analogs. The data are consistent with a structure for the 7 A phase similar to that of chalcophanite. A mineral showing approximately 10 A basal plane reflections is found in deep sea Mn nodules, where it is associated with high concentrations of Cu, Ni, and other metal ions. There are three substitution sites in the 10 A phase per formula unit. The arrangement of these sites is different. In the synthetic phase, the sites are isolated from each other while in the natural mineral, they are adjacent, forming rows. These two structures result in different occupation numbers for the second nearest neighbor shells; a difference that appears convincingly in XAS spectra. The three 10 A manganates show effectively identical X-ray powder patterns. Dissert. Abstr.

N81-31715 California Univ., San Diego.
CARBON AND HYDROGEN GASES IN HYDROTHERMAL SYSTEMS: THE SEARCH FOR A MANTLE SOURCE Ph.D. Thesis
John Andrew Welhan 1981 216 p
Avail: Univ. Microfilms Order No. 8116841

A comparison of hydrothermal gases from the East Pacific Rise at 21 deg N with two continental hydrothermal systems in contrasting tectonic environments provided direct evidence of a mantle carbon input to the hydrosphere, and the alteration of its isotopic and chemical signature in continental hydrothermal environments. It is concluded that carbon in the East Pacific Rise water-rock system is predominantly of mantle origin. Although the data represent evidence for abiogenic methane in a thermal environment, it is not certain whether CH4 is being extracted directly from basalt, or whether it represents chemical equilibrium in the C-H-O system. Dissert. Abstr.

N81-31716# Royal Society, London (England). Div. of Geological and Planetary Sciences.
A MODE OF DISLOCATION-CONTROLLED RHEOLOGY FOR THE MANTLE
J. B. Minster and D. L. Anderson London Royal Society 11 Feb. 1981 39 p refs Repr. from Phil. Trans. of The Roy. Soc. of London. A: Math. and Phys. Sci. (England), v. 299, no. 1449, 11 Feb. 1981 p 319-356
(ISSN-0080-4614) Copyright. Avail: Issuing Activity

A physical model for the dislocation microstructure of the Earth's mantle is developed. The model accounts simultaneously for long term steady state creep and for stress wave attenuation at seismic frequencies. An organized microstructure in which most dislocations are found inside walls is considered. The glide of intragrain dislocations explains the magnitude and frequency range of seismic attenuation. Steady state creep is governed by recovery through climb and annihilation in cell walls. The width of the seismic absorption band is limited by the long term tectonic stress, and its actual position determined as a result of a trade off between temperature, pressure, and tectonic stress. The model provides a physical framework within which the quality factor Q and viscosity are related via the dislocation structure. J.D.H.

N81-31717*# Ohio State Univ., Columbus. Dept. of Physics.
A SPECTRUM OF CARBON DIOXIDE FROM 800 TO 5500 cM-1 Interim Technical Report
D. H. Smith, M. L. Hoke, R. A. Hawkins, and J. H. Shaw Sep. 1981 453 p refs
(Grant NsG-7479)
(NASA-CR-164720) Avail: NTIS HC A20/MF A01 CSCL 04A

An atlas of CO2 lines obtained from long path length samples at 296 K is presented. Many of the line centers are marked and their positions tabulated. T.M.

N81-31718*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STATISTICAL STUDY OF PRECIPITATING ELECTRONS Final Report
Ernest G. Fontheim, K. Stasiewicz, M. O. Chandler, R. S. B. Ong, and R. A. Hoffman Jul. 1981 64 p refs Prepared in cooperation with Michigan Univ., Ann Arbor
(Grant NsG-5281)
(NASA-TM-80458) Avail: NTIS HC A04/MF A01 CSCL 04A

Energy spectra of precipitating electrons are fitted to the sum of three distributions: a power law, a Maxwellian and a Gaussian. This fitting procedure determines seven parameters which characterize the essential features of each spectrum. These characteristic parameters are used to carry out various studies involving precipitating electrons. It is shown that the absence of the power-law population from a particular spectrum is related to the softness of the precipitating primary flux, that the Maxwellian temperature and the Gaussian peak energy have a positive correlation the strength of which varies with local time, that the upward moving Gaussian population has a loss cone distribution, and that the one dimensional velocity distribution parallel to the magnetic field occasionally displays a plateau or a hump on the tail. Author

N81-31719*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SOUNDING-ROCKET EXPERIMENT TO STUDY THE DIFFUSE SOFT X-RAY BACKGROUND USING A SI(LI) DETECTOR Final Report
John P. Delvaille Sep. 1981 34 p refs
(Grant NsG-5304)
(NASA-CR-164724) Avail: NTIS HC A03/MF A01 CSCL 04A

Soft X-ray background in the energy range 0.4 to 10 keV was studied. A payload was developed which uses a wide angle, windowless, cooled, Si(Li) semiconductor detector system. With a resolution of less than 150 eV between 0.3 and 2.0 keV, the system is sensitive to an emission equivalent width of about 10 eV. Carbon and oxygen line emission were detected from the vicinity of the North Galactic Pole and the North Polar Spur. T.M.

N81-31720*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TOMS NEAR REALTIME SYSTEM DESIGN DOCUMENT
Edward F. Puccinelli Aug. 1981 90 p refs
(NASA-TM-82170) Avail: NTIS HC A05/MF A01 CSCL 04A

The System Design Document for the TOMS (Total Mapping Spectrometer) Near Realtime System provides detailed definition of the system functions and records the system history from a data processing and development point-of-view. The system was designed to produce map products displaying ozone concentrations over the United States as measured by the TOMS flown on the NIMBUS 7 satellite. The maps were produced and delivered to the user within six hours of round receipt of the satellite data for the period March 1, 1981 through May 15, 1981 on a daily basis. Sample system products are shown and data archival locations are listed. Author

N81-31721*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE COMPENSATION OF GEOID ANOMALIES DUE TO SUBDUCTING SLABS
David C. McAdoo Jun. 1981 24 p refs
(NASA-TM-82157) Avail: NTIS HC A02/MF A01 CSCL 08G

Candidate models of the forces which oppose the sinking of slabs are all constrained to produce results consistent with the following observation: relative geoid highs, which one assumes are due to slabs, characteristically occur over subduction zones. Certain models which are otherwise plausible, such as those based on a Newtonian half-space mantle, yield geoid lows instead of highs. This study has extended a published model of viscous corner flow in subduction zones in order to demonstrate that it can, in certain cases, produce the requisite geoid highs. Specifically the relative geoid highs are produced if mantle flow is distinctly non-Newtonian (stress exponent $n > 2$). Results in the form of deflection on vertical (or geoid slope) profiles are computed for typical values of the slab parameters; they are compared with a representative profile of geoid slopes derived from Seasat altimeter data in order to show qualitative similarities. It is concluded that the effect of non-Newtonian flow as opposed to Newtonian, is to spread out the induced surface deformation, thereby stretching out the regional compensation to wavelengths, (transverse to the trench) of several thousand kilometers. Author

N81-31722# Boston Univ., Mass.
COMPUTER SIMULATION TECHNIQUES FOR ARTIFICIAL MODIFICATION OF THE IONOSPHERE Final Report, 31 Jan. 1979 - 30 Apr. 1981
Bradley Vance and Michael Mendillo 30 Apr. 1981 47 p refs
(Contract F19628-79-C-0022; AF Proj. 2311)
(AD-A102302; AFGL-TR-81-0119) Avail: NTIS HC A03/MF A01 CSCL 04/2

A three dimensional model of the ionosphere was developed including chemical reactions and neutral and plasma transport. The model uses Finite Element Simulation to simulate ionospheric modification rather than solving a set of differential equations. The initial conditions of the Los Alamos Scientific Laboratory experiments, Lagopedo Uno and Dos, were input to the model, and these events were simulated. Simulation results were compared to ground and rocketborne electron-content measurements. A simulation of the transport of released SF6 was also made. Author (GRA)

N81-31723# Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
DETERMINISTIC METHODS OF SEISMIC SOURCE IDENTIFICATION Annual Technical Report, 1 Apr. - 30 Sep. 1980
C. B. Archambeau 20 Jul. 1981 145 p refs
(Contract F49620-80-C-0018; ARPA Order 3291)
(AD-A102333; AFOSR-81-0614TR; ATR-2) Avail: NTIS HC A07/MF A01 CSCL 17/10

In this report we describe methods of modal synthesis which provide very detailed theoretical seismograms in the near and regional distance ranges. We give the mathematical basis for the method, along with some examples of its use. We also describe a sophisticated automatic signal analysis program, which is to be used to generate discrimination variables from observed data. The program and underlying procedures were tested using synthetic seismic signals in order to evaluate its performance in the presence of interfering noise. The signal analysis program was also applied to observed seismic data. The purpose of this program is to isolate particular, important, seismic phases (discrete signals) and to obtain accurate estimates of the spectral characteristics of these signals for purposes of event discrimination. Based on its performance, on a variety of observed and synthetic seismic data, it appears that the method can provide much enhanced discrimination/event identification capability, over currently used methods. Finally we illustrate, and discuss, the use of theoretical event magnitude data (m sub b and M sub s) as a basis for event identification. In particular we show that, based on theoretical m sub b versus M sub s relations obtained by synthesizing seismic wave fields in the teleseismic distance range, we can obtain good estimates of seismic source parameters, in particular stress changes and failure zone dimensions for earthquakes and effective stress and nonlinear zone dimensions for explosions, and can use these parameters to form a discrimination available which can serve as a very effective means of discriminating underground explosions from earthquakes. GRA

N81-31724# Teledyne Geotechnical, Alexandria, Va. Seismic Data Analysis Center.
SEISMIC DATA ANALYSIS CENTER Final Report
Paul Kovacs 22 Jun. 1981 47 p
(Contract F08606-79-C-0006; DARPA Order 2551)
(AD-A102537; SDAC-TR-80-1; VSC-TR-81-13) Avail: NTIS HC A03/MF A01 CSCL 08/11

The operation and maintenance of the Seismic Data Analysis Center (SDAC) are summarized for the contract year beginning 1 October 1978 and ending 30 September 1979. Reported are the statistics relating to computer usage; information relating to the maintenance, programming, data services, data availability; and the effort to expand the research systems at the facility. This final report summarizes the operation and maintenance of the computer systems at the Seismic Data Analysis Center (SDAC) in Alexandria, Virginia. The work performed to augment and expand the online and research systems is also reported. Other activities, such as facility improvements, demonstrations, operations, and data services are also discussed. GRA

N81-31725# Science Applications, Inc., McLean, Va.
ELECTRON TRANSPORT, CHEMISTRY AND OPTICAL EMISSIONS IN THE AURORAL E-LAYER Final Report, 3 Jan. 1978 - 30 Sep. 1980
D. J. Strickland Jan. 1981 98 p refs
(Contract F19628-78-C-0073; AF Proj. 4643)
(AD-A102345; AFGL-TR-81-0042) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report discusses a study related to ionospheric content and optical emissions in the auroral E-layer. The electron transport description was provided by a model previously developed by the author. The applied chemistry model, which is time dependent and includes several ion and neutral species, was developed during this study. Results for several sets of initial conditions are presented. These results include ion production rates, ion densities, and column emission rates for selected UV features. For initial conditions, two model atmospheres and incident electron fluxes from two experiments and for a Maxwellian expression are considered. Calculated ion densities and emission rates are compared with available measurements from one of these experiments and show reasonable agreement. Maxwellian distributions are considered for characteristic energies of .5, 1.0, 2.5, and 5.0 keV. Altitude profiles of the important individual ion densities and vertically viewing column emission rates of various important UV features are presented for each of these distributions. In addition to the above described results, a large quantity of atomic and molecular data collected during this program is given. In the Appendix, the problem of ion transport is discussed with an estimate of its effect on the calculated ion densities. Author (GRA)

N81-31726# State Univ. of New York at Albany. Research Foundation.
A STUDY OF STRATOSPHERIC DISCHARGES Final Report, 1 Mar. 1978 - 28 Feb. 1981
Richard E. Orville and Bernard Vonnegut Hanscom AFB, Mass. AFGL May 1981 17 p
(Contract F19628-78-C-0007; AF Proj. 6687)
(AD-A102284; AFGL-TR-81-0149) Avail: NTIS HC A02/MF A01 CSCL 04/1

Observational data and theoretical considerations in the literature suggest that the electrical activity of large thunderstorms can result in lightning and other dielectric breakdown processes within the stratosphere. Field investigations have been undertaken to secure data on the nature of these discharges and their frequency of occurrence. Studies of lightning spectra made from the ground in New York and New Mexico failed to indicate anomalous spectra that might characterize low pressure discharges in the stratosphere. Photographs, spectral observations, and field change measurements were made from a U-2 aircraft looking down on an active thunderstorm suggesting that lightning discharges can frequently be produced that will traverse stratospheric air. Author (GRA)

N81-31727# Naval Surface Weapons Center, Dahlgren, Va.
POLE POSITION FOR 1980 BASED ON DOPPLER OBSERVATIONS OF THE GEOS-3 SATELLITE Final Report
R. J. Anderle Jun. 1981 33 p refs
(AD-A102548; NSWC/TR-81-246) Avail: NTIS HC A03/MF A01 CSCL 22/3

The position of the Earth's spin axis with respect to the crust (polar motion), was computed for the last three months of 1980 by the Defense Mapping Agency Aerospace Center on the basis of Doppler observations of the GEOS-3 satellite. The results were obtained as a contribution to project MERIT, an international campaign to determine the best technique to replace classical astronomical procedures used to determine polar motion since 1900. GRA

N81-31728# Los Alamos Scientific Lab., N. Mex.
EVALUATION OF SOME GEOPHYSICAL EVENTS ON 22 SEPTEMBER 1979
E. W. Hones, Jr., D. N. Baker, and W. C. Feldman Apr. 1981 20 p refs
(Contract W-7405-eng-36)
(LA-8672) Avail: NTIS HC A02/MF A01

The TIROS-N plasma data and related geophysical data measured on 22 September 1979 were analyzed to determine

whether the electron precipitation event detected by TIROS-N at 00:54:49 universal time could have been related to a surface nuclear burst (SNB). The occurrence of such a burst was inferred from light signals detected by two Vela bhangmeters approx. 2 min before the TIROS-N event. The precipitation was found to be unusually large but not unique. DOE

N81-31729# Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.

DYNAMICS OF THE ATMOSPHERIC BOUNDARY LAYER DURING THE 1980 TOTAL SOLAR ECLIPSE

S. SethuRaman 1981 24 p refs Presented at Intern. Symp. of 16 Feb. 1980 Solar Eclipse, New Delhi, 27-31 Jan. 1981

(Contract DE-AC02-76CH-00016)

(BNL-29497; CONF-810144-2) Avail: NTIS HC A02/MF A01

An atmospheric boundary layer experiment was conducted. The variations in the surface shear stress, heat flux and the meteorological processes that take place during a total solar eclipse were studied. Results were observed regarding the evolution of the planetary boundary layer. Changes in atmospheric stability from unstable to stable to unstable were observed during different phases of the eclipse. Downward propagation of negative heat flux associated with decreasing scales of convective eddies was also observed during the eclipse. DOE

N81-31730# California Univ., Livermore. Lawrence Livermore Lab.

OZONE DEPLETION CALCULATIONS

Frederick M. Luther, Julius S. Chang, Donald J. Wuebbles, and Joyce E. Penner Apr. 1981 29 p refs Presented at the NATO Advanced Res. Inst. on the Effects of Solar Ultraviolet Radiation on Marine Ecosystems, Copenhagen, 28-31 Jul. 1980

(Contract W-7405-eng-48)

(UCRL-85814; CONF-800710201) Avail: NTIS HC A03/MF A01

In order to assess the potential impact of proposed perturbations on stratospheric ozone, mathematical models were developed to handle the complex coupling between chemical, radiative, and dynamical processes. Basic concepts in stratospheric modeling are reviewed. Of the proposed atmospheric perturbations shown to have a potentially significant effect on stratospheric ozone, chlorofluorocarbons (CFC) present the most significant threat (the estimated change in total being about - 9 percent at steady state for continued CFC release at the current rate). Two dimensional model calculations indicate that the largest decreases in ozone would likely occur at high latitudes in winter or spring. DOE

N81-31731# Dames and Moore, Park Ridge, Ill.

DEMONSTRATION OF SUBSIDENCE MONITORING SYSTEM Final Report, 29 Sep. 1978 - Jun. 1981

Peter J. Conroy, Julie H. Gyarmaty, and Mary L. Pearson Jun. 1981 435 p ref

(Contract DE-AC01-78ET-10029)

(DOE/ET-10029/T1; DM-10805-008-07) Avail: NTIS HC A19/MF A01

Data on coal mine subsidence were studied as a basis for the development of subsidence control technnology. Installation, monitoring, and evaluation of three subsidence monitoring instrument systems were examined: structure performance, performance of supported systems, and performance of caving systems. Objectives of the instrument program were: (1) to select, test, assemble, install, monitor, and maintain all instrumentation required for implementing the three subsidence monitoring systeems; and (2) to evaluate performance of each instrument individually and as part of the appropriate monitoring system or systems. The use of an automatic level and a rod extensometer for measuring structure performance, and the automatic level, steel tape extensometer, FPBX, FPBI, USBM borehole deformation gauge, and vibrating wire stressmeters for measuring the performance of caving systems are recommended. DOE

N81-31732# United Technologies Research Center, East Hartford, Conn.

SIMULATION OF D AND E REGION HIGH-POWER MICROWAVE HEATING WITH HF IONOSPHERIC MODIFICATION EXPERIMENTS

G. Meltz, C. M. Rush (Inst. for Telecommunication Sciences), and E. J. Violette (Inst. for Telecommunication Sciences) 1981 72 p refs

(Contract DE-AI01-80ER-10160)

(DOE/ER-10160/4) Avail: NTIS HC A04/MF A01

The microwave power beam from a Solar Power Satellite (SPS) is sufficiently intense to cause large changes in the properties of the lower ionosphere by ohmic heating of the plasma. Power is absorbed from the beam at a rate that is proportional to the ratio of the flux s and the square of an effective frequency f/sub e/. A detailed examination of the frequency scaling, based on fluid and kinetic theory estimates of the change in electron temperature and density, shows that the high-power HF facility at Platteville, CO, can simulate or exceed the ohmic effects of the SPS beam up to 90 km. Results of a series of 5.2 and 9.9 MHz underdense heating experiments undertaken to study the effect of high-power microwaves on the lower ionosphere are described. DOE

N81-31733# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

TIDAL TILT MEASUREMENTS AT THE SCHILTACH GEOPHYSICAL LABORATORY [GEZEITENNEIGUNGSMESSUNGEN IM GEOWISSENSCHAFTLICHEN GEMEINSCHAFTSOBSERVATORIUM SCHILTACH]

Hermann Maelzer, Heinrich Kiesel, Walter Zuern, Dieter Emter, Harald Schlemmer, and Heinz Otto 1979 41 p refs In GERMAN; ENGLISH summary

(Ser-B-245; ISSN-0065-5317; ISBN-3-7696-8539-3) Avail: NTIS HC A03/MF A01

Tidal tilt results from six different sites within the Schiltach mine observatory involving four different types of instruments are reported. A comparison with theoretical tide parameters should discriminate between instrumental or regional tectonic influences and strain induced tilts from local inhomogeneities. The site topography and geology is recalled and the tide station described. The different instruments (vertical pendulum, horizontal pendulum and liquid drop types), mounting, measuring procedure, and data processing are treated. The results comprise tidal measurements of the main tides M2, O1, K1, and S2, tilt and residual ellipses, amplitude spectra, and coupling coefficients. The mean errors of the vertical pendulum instruments are found to be persistently smaller. Strong significant scatter of O1 and M2 tidal parameters is interpreted as strain induced tilting stemming from local heterogeneities. Author (ESA)

N81-31734# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

ON THE NUMERICAL ANALYSIS OF THE WEIGHT OPTIMIZATION OF GEODETIC NETS Thesis - Karlsruhe Univ. [ZUR NUMERIK DER GEWICHTSOPTIMIERUNG IN GEODAETISCHEN NETZEN]

Guenter Schmitt 1979 48 p refs In GERMAN

(Ser-C-256; ISSN-0065-5325; ISBN-3-7696-9308-6) Avail: NTIS HC A03/MF A01

A defect analysis is carried out on the system of linear equations pertaining to the weight optimization scheme with given criterion matrix of second order net design. This allows the development of solution strategies for large nets which are numerically economical. A comparison with canonical or simplex design methods shows that numerical solutions are preferable in second order design. The defect analysis of the end equations shows that the weight optimization of both a free distance net and a free direction net possesses a regular least squares solution It is also concluded that the design of free direction nets might follow two optimal strategies: (1) if the directions are given a global weight, elimination of the orientation unknowns should be preferred; and (2) if an individual weight is given, a Khatri-Rao product should be formed. Examples of the different methods are shown. Author (ESA)

N81-31735# Royal Inst. of Tech., Stockholm (Sweden). Dept of Plasma Physics.

DOUBLE LAYERS IN THE LABORATORY AND ABOVE THE AURORA

Lars P. Block Nov. 1980 24 p refs

(TRITA-EPP-80-12; ISSN-0348-7539) Avail: NTIS

HC A02/MF A01

Improvements in laboratory double layer experiments are described, and results are compared with auroral double layer observations. The improvements include magnetic fields strong enough to magnetize the electrons, mapping of the three dimensional potential distribution and measurements of particle and wave spectra. A detailed comparison with auroral double layers is presented. Both similarities and differences between the laboratory and conditions in space are found. Plasma sources at different potentials (ionosphere and magnetosphere) usually lead to formation of double layers. A critical electron drift velocity is required on the low potential side. The particle velocity distributions in the laboratory differ in some respects from those observed in space but their distribution after acceleration are rather similar to auroral precipitation spectra. Waves do not play an essential role in maintaining a layer.

Author (ESA)

N81-31736# National Geodetic Survey, Rockville, Md.

DETERMINATION OF PLUMB LINE CURVATURES BY ASTRONOMICAL AND GRAVIMETRIC METHODS

Erwin Groten Feb. 1981 25 p refs

(PB81-198723; NOAA-TM-NOS-NGS-30; NOAA-81031602) Avail: NTIS HC A02/MF A01 CSCL 08E

By taking terrain inclination data from topographic maps, as well as elevations and conservation estimates of horizontal gravity gradients, it is shown that the determination of actual plumb line corrections is practically impossible. By varying the data to within reasonable limits totally different estimates for the constituents of the plumb line correction are found. Taking into account the 30 second by 30 second estimates for mean elevations in the United States, it seems that the only fairly reliable estimate of actual plumb line corrections is obtained from topographic models. Also, normal plumb line curvature is considered. GRA

N81-31737# California Univ., Davis. Water Resources Center.

CHEMICAL AND MINERALOGICAL COMPOSITION AND BEHAVIOR OF THE MANCOS SHALE AS A DIFFUSE SOURCE OF SALTS IN THE UPPER COLORADO RIVER BASIN Ph.D. Thesis

Vasilios Petros Evangelou Mar. 1981 211 p refs

(PB81-197626; W81-02711; OWRT-B-201-CAL(1)) Avail: NTIS HC A10/MF A01 CSCL 08G

The overall investigation revealed the primary source of salts. Salts are derived from carbonates, calcite and dolomite, which upon contact with sulfuric acid (produced by the biological oxidation of pyrite), produce gypsum and magnesium sulfates.

GRA

N81-31738# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

SULFUR DIOXIDE OXIDATION REACTIONS IN AQUEOUS SOLUTIONS Final Report, Aug. 1977 - Dec. 1980

L. R. Martin, D. E. Damschen, and H. D. Judeikis May 1981 38 p refs

(Contract EPA-68-02-2702)

(PB81-196834; ATR-81(7700)-1; EPA-600/7-81-085) Avail: NTIS HC A03/MF A01 CSCL 04A

The kinetics and mechanisms of some 105 reactions involving the aqueous oxidation of sulfur dioxide and nitrogen oxides in mixed catalyst-oxidant systems at low pH (0-3) were studied. The 105 systems involve six redox reaction types: SO2/O2; SO2/NOx; SO2/H2O2; SO2/O3; NOx/O3; NOx/H2O2. Mn(+2) and Fe(+2) are the only important metal catalysts. In the SO2/NOx system the reaction is rapid producing N2O. The SO2/H2O2 is extremely rapid and could account for the rapid formation of sulfate in the atmosphere when significant amounts of aerosol are present. The SO2/O3 reaction is not as rapid as the peroxide but the relative concentrations of the two makes the ozone reaction also significant. GRA

N81-31739# Environmental Protection Agency, Research Triangle Park, N.C.

GUIDELINE FOR FLUID MODELING OF ATMOSPHERIC DIFFUSION

William H. Snyder (NOAA) Apr. 1981 200 p refs

(PB81-201410; EPA-600/8-81-009; FMR-10) Avail: NTIS HC A09/MF A01 CSCL 04A

The usefulness of fluid models are evaluated from both scientific and engineering viewpoints. Because many detailed decisions must be made during the design and execution of each model study, and because the fundamental principles frequency do not provide enough guidance, extensive discussion of the details of the most common types of modeling problems are provided. The hardware requirements are also discussed. This guidance is intended to be of use both to scientists and engineering involved in operating fluid modeling facilities and to air pollution control officials in evaluating the quality and credibility of the reports from such studies. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N81-31740 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

METEOROLOGICAL DATA. VOLUME 2, NUMBER 2: SYNOPTIC STRATOPAUSE METHOD FOR COMPUTATION OF TEMPERATURE PROFILES FROM SATELLITE MEASUREMENTS OF THE INFRARED RADIATION DURING WINTER WARMINGS, SERIES A MONOGRAPHS Ph.D. Thesis [METEOROLOGISCHE ABHANDLUNGEN, NEUE FOLGE, SERIE A MONOGRAPHIEN, BAND 2, HEFT 2. SYNOPTISCHE STRATOPAUSENMETHODE ZUR BERECHNUNG VON TEMPERATURPROFILEN AUS SATELLITENMESSUNGEN DER INFRAROTSTRAHLUNG WAEHREND WINTERLICHER STRATOSPHAERENERWAERMUNGEN]

Karin Petzoldt Verlag von Dietrich Reimer 1980 115 p refs In GERMAN

(ISSN-0342-4324) Copyright. Avail: Issuing Activity

A derivation of the temperature profiles from a solution of the integral radiation equation by means of a temperature function is shown to be preferable to the usual statistical regression methods. Such profiles form the basis for dynamical models of circulation inversions in the stratosphere in winter. The vertical temperature distribution is shown to be approximated in a logarithmic pressure plot by linear segments between the major isobars and the stratopause. When used in the inversion of the infrared radiation measurements this assumption is shown to incorporate the information of all available synoptic data. It is shown that rocket measurements significantly alter the conclusions from satellite measurements, limited by spatial resolution and random statistics. The method is further applied to a derivation of geopotential fields and of geostrophic wind components. The construction of appropriate dynamical models is held to depend heavily on detailed space and time resolved profiles such as those obtainable by the present method. Author (ESA)

N81-31741 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

METEOROLOGICAL DATA. VOLUME 3, NUMBER 3: SPECTRAL ANALYSIS OF GEOPOTENTIAL ALONG LATTITUDE 50 N FOR SUMMER AND WINTER, SERIES A MONOGRAPHS [METEOROLOGISCHE ABHANDLUNGEN, NEUE FOLGE, SERIE A MONOGRAPHIEN, BAND 3, HELFT 3. SPEKTRALE AUSWERTUNGEN DES GEOPOTENTIALS ENTLANG 50 N FUER WINTER UND SOMMER]

Horst Boettger 1979 164 p refs In GERMAN; ENGLISH summary

(ISSN-0342-4324) Copyright. Avail: Issuing Activity

A spectral analysis of geopotential, mean temperature of thickness layers, and meridional geostrophic wind along latitude 50 N on selected tropospheric and stratospheric pressure levels, taken over nine years beginning in 1969, is presented. The objective was the establishment of statistical data on planetary circulation in the west wind zones and on the structure of mid-latitude disturbances in the Northern Hemisphere. Time and zonal average, cell terms, standing eddies, and transient eddies of potential, temperature, and wind components together with their contribution to the total variance and the total meridional geostrophic temperature transport are time and Fourier analyzed.

Transient eddies are shown to be characterized by three significantly separated variance maxima. Heat transport by transient and standing eddies are of opposite sign only in summer. The observations suggest an explanation for the oscillations between high and low zonal index situations in the west wind zone. Author (ESA)

N81-31742 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

METEOROLOGICAL DATA. VOLUME 3, NUMBER 4: COMPARATIVE INVESTIGATION BETWEEN THE CLIMATE PREVAILING DURING THE FULL 24-HOUR DAY AND THAT DURING THE NINE-HOUR WORKING DAY (7 A.M. - 4 P.M.) IN BERLIN, SERIES A MONOGRAPHS [METEOROLOGISCHE ABHANDLUGEN, NEUE FOLGE, SERIE A MONOGRAPHIEN, BAND 3, HEFT 4. VERGLEICHENDE UNTERSUCHUNG ZWISCHEN DEM KLIMA DES 24-STUENDIGEN NORMALTAGES (00-24 UHR) UND DES 9-STUENDIGEN ARBEITSTAGES (07-16 UHR) IN BERLIN]

Thomas Koenig 1979 63 p refs In GERMAN
(ISSN-0342-4324) Copyright. Avail: Issuing Activity

A comparison is made between the average values of temperature, rainfall, wind speed and wind direction recorded in the Berlin area. Such a comparison provides valuable information to building contractors, organizers of outdoor acitivities, etc. The data base consists of observations made every three hours from 1953 to 1972 and every hour from 1972 to 1976. The nine hour period is characterized by an enhanced wind velocity during the warmer months and by a yearly average temperature increase of about one deg C. The working day is predominantly dry, although at its end (4 p.m.) a pronounced maximum of rainfall is present. Annual variations of the same parameters are also discussed. Author (ESA)

N81-31743*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-1) LAUNCH

D. L. Johnson, G. Jasper, and S. C. Brown Jul. 1981 49 p refs
(NASA-TM-82436) Avail: NTIS HC A03/MF A01 CSCL 04B

Atmospheric conditions near space shuttle STS-1 launch time on April, 12, 1981, at Kennedy Space Center, Florida, are reported. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is presented. Also presented are the wind and thermodynamic parameters measured at the surface and aloft in the SRB descent/impact ocean area. Final meteorological data tapes for STS-1 vehicle ascent, and SRB descent have been constructed which consist of wind and thermodynamic parameters versus altitude. E.A.K.

N81-31744*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ACCOMMODATIONS ASSESSMENT: SPACEBORNE DOPPLER LIDAR WIND MEASURING SYSTEM

Aug. 1981 70 p refs
(NASA-TM-82435; PD34) Avail: NTIS HC A04/MF A01 CSCL 04B

An accommodations analysis performed by the MSFC Preliminary Design Office for a spaceborne Doppler lidar wind measuring system is summarized. A dedicated, free-flying spacecraft design concept is described. Mass and beginning-of-life power requirements are estimated at 2260 kg and 6.0 - 8.5 kW respectively, to support a pulsed, CO_2, Doppler lidar having a pulse energy of 10 J, pulse rate of 8 Hz, and efficiency of approximately 5%. Under the assumptions of the analysis, such a system would provide wind measurements on a global scale, with accuracies of a few meters per second. Author

N81-31745*# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.

A SUBSYNOPTIC-SCALE KINETIC ENERGY STUDY OF THE RED RIVER VALLEY TORNADO OUTBREAK (AVE-SESAME 1) Interim Report

Gary J. Jedlovec and Henry E. Fuelberg Washington, D.C. NASA Aug. 1981 128 p refs
(Contract NAS8-33370)
(NASA-CR-3456; M-355) Avail: NTIS HC A07/MF A01 CSCL 04B

The subsynoptis-scale kinetic energy balance during the Red River Valley tornado outbreak is presented in order to diagnose storm environment interactions. Area-time averaged energetics indicate that horizontal flux convergence provides the major energy source to the region, while cross contour flow provides the greatest sink. Maximum energy variability is found in the upper levels in association with jet stream activity. Area averaged energetics at individual observation times show that the energy balance near times of maximum storm activity differs considerably from that of the remaining periods. The local kinetic energy balance over Oklahoma during the formation of a limited jet streak receives special attention. Cross contour production of energy is the dominant local source for jet development. Intense convection producing the Red River Valley tornadoes may have contributed to this local development by modifying the surrounding environment. S.F.

N81-31746*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE OUTLOOK FOR PRECIPITATION MEASUREMENTS FROM SPACE

D. Atlas, J. Eckerman, R. Meneghini, and R. K. Moore (Kansas Univ.) Jul. 1981 26 p refs Presented at 20th Conf. on Radar Meteorol., Boston, 29 Nov. - 3 Dec. 1981
(NASA-TM-82172) Avail: NTIS HC A03/MF A01 CSCL 04B

To provide useful precipitation measurements from space, two requirements must be met: adequate spatial and temporal sampling of the storm and sufficient accuracy in the estimate of precipitation intensity. Although presently no single instrument or method completely satisfies both requirements, the visible/IR, microwave radiometer and radar methods can be used in a complementary manner. Visible/IR instruments provide good temporal sampling and rain area depiction, but recourse must be made to microwave measurements for quantitative rainfall estimates. The inadequacy of microwave radiometer measurements over land suggests, in turn, the use of radar. Several recently developed attenuating-wavelength radar methods are discussed in terms of their accuracy, dynamic range and system implementation. Traditionally, the requirements of high resolution and adequate dynamic range led to fairly costly and complex radar systems. Some simplications and cost reduction can be made; however, by using K-band wavelengths which have the advantages of greater sensitivity at the low rain rates and higher resolution capabilities. Several recently proposed methods of this kind are reviewed in terms of accuracy and system implementation. Finally, an adaptive-pointing multi-sensor instrument is described that would exploit certain advantages of the IR, radiometric and radar methods. Author

N81-31747# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

DEVELOPMENT AND PRESENT STATE OF GERMAN PERIGLACIAL RESEARCH IN THE POLAR, SUBPOLAR AND ALPINE ENVIRONMENT

Johannes Karte 1981 64 p refs Transl. into ENGLISH of "Entwicklung und Gegenwartiger Stand der Deutschen Perigalziarforschung im Polaren, Subpolaren und Alpien Milien" Ruhr Univ., Bochum, West Germany, 1979
(NRC/CNR-TT-1983; ISSN-0077-5606) Avail: NTIS HC A04/MF A01

The range of periglacial environmental factors and their complex interrelation is considered. Research results in the field of periglacial climatic conditions and frozen ground, especially permafrost, are reviewed. Periglacial micromorphodynamics and microrelief features are discussed. With regard to patterned ground studies, sorted forms have received most attention. Studied in periglacial meso- and macromorphodynamics, especially cryoplanation forms, convexo-concave slope profiles, and periglacial fluvial activity, are discussed. Investigations dealing with the spatial delimitation and regionalization of the polar and alpine perglacial zone are summarized. The delimitation and subdivision are regionally differentiated, consequently the specific climatic

threshold values of the periglacial zone and its regional types are also regionally variable. J.D.H.

N81-31748# Research Inst. of National Defence, Stockholm (Sweden).
WIND MEASUREMENTS BY PARACHUTE [PROV MED VINDVISERING MOT FALLSKAERM]
Sven Nordstroem Mar. 1980 38 p refs In SWEDISH Original contains color illustration
(FOA-C-20344-D2) Avail: NTIS HC A03/MF A01

Earlier results of wind measurements by radar observation of a parachute rather than a balloon justify continued investigations by releasing parachutes at higher altitudes. Experiments used the 8 cm 'Lotta' grenade, as well as the 12 cm M/70 and 10.5 cm M/62 grenades, released at altitudes between 2000 and 6400 meters. The parachutes were tracked by 'AP' as well as 'RFK'. In later experiments wind data were also obtained for comparison by tracking a hydrogen balloon partly with the 'CORA' system, partly by radar. Generally, radar picked up the objects without visual assistance. Wind measurements from parachutes correlated well with those obtained by balloon. Even when radar locked on to a part of the grenade, descending considerably faster than the parachutes, some of the measurements obtained were good. Bodies with a greater rate of descent than parachutes, with less or no tendency towards drift and with sufficient surface area for radar tracking, ought to provide reliable results. The existence of vertically well defined jet stream type winds was established at low altitudes. J.M.S.

N81-31749# Centre National d'Etudes Spatiales, Toulouse (France).
SUN AND CLIMATE
1980 484 p refs Partly in ENGLISH and FRENCH Proceedings of CNES Intern. Conf., Toulouse, 30 Sep. - 3 Oct. 1980; sponsored by CNRS and Delegation Generale a la Recherche Scientifique and Technique
Avail: NTIS HC A21/MF A01

The problems of solar activity and possible effects on climate are addressed. Both long term and short term variations are discussed. Mechanisms for solar-terrestrial relations were put forward, and the evolution and fluctuation of the solar constant were considered. Measurements of the solar constant from space are described. For individual titles, see N81-31750 through N81-31783.

N81-31750# East Anglia Univ., Norwich (England). Climatic Research Unit.
CLIMATIC TRENDS AT HIGH NORTHERN LATITUDES DURING THE LAST 4,000 YEARS COMPARED WITH CARBON 14 FLUCTUATIONS
L. D. Williams, T. M. L. Wigley, and P. M. Kelly *In* CNES Sun and Climate 1980 p 11-20 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Published dates on high tree line and glacier advance in Alaska and Scandinavia and ice core, pollen and historical data from locations between are compared with atmospheric C-14 variations between 2000 BC and 1800 AD. The direction of temperature change implied by the proxy climatic data is compared with that expected according to the C-14 climate correspondence. This is done for each of the main episodes of C14 fluctuation, and also for a 50 year lag in the C-14 change. In both cases, the total agreement is close to 50%, which could either be because there is no physical link, or due to dating imprecision and misinterpretation of the proxy climate record. Author (ESA)

N81-31751# Observatoire de Meudon (France).
VARIABLE CORPUSCULAR AND ELECTROMAGNETIC EMISSIONS FROM THE SUN
M. Pick *In* CNES Sun and Climate 1980 p 21-31 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The physical origin of the different thermal radiation components and their variability are reviewed. Their properties are shown to depend on the structure of the solar atmosphere and on the temperature and density distribution with height. The origin of high speed solar wind streams is reviewed and related to coronal holes. Characteristics of solar flares are summarized, including evolution, energy budget and production of particle events. Particle emissions include a permanent component, discrete events, pure electron events, proton events and interplanetary very low energy events. Author (ESA)

N81-31752# Observatoire de Meudon (France).
SOLAR CYCLE AND SOLAR TERRESTRIAL RELATIONSHIPS
P. A. Simon and J. P. Legrand (Lab. de Geophysique Externe du CNRS) *In* CNES Sun and Climate 1980 p 33-44 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Signatures in solar activity which may aid in identifying responses of the Earth atmosphere are discussed. The XUV cycle has an 11 year periodicity with a superimposed amplitude wave of 22 years. Minima show a more reliable periodicity than any other part of the cycle. The interplanetary medium shows a double peak cycle: the first out of phase with sunspot cycle, is generated by stable wind streams generated by polar holes and the second, in phase with sunspot cycle, is caused by shock waves generated by sunspot evolution. Both activities reach a level which closely correlates with the maximum of the sunspot cycle of the second peak. Author (ESA)

N81-31753# Royal Netherlands Meteorological Inst., De Bilt.
TEMPERATURE VARIABILITY AND THE 22 YEAR SOLAR CYCLE
C. J. E. Schuurmans *In* CNES Sun and Climate 1980 p 45-54 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Year-to-year variability of temperature, or an equivalent quantity like standard deviation, is not constant in time. Time changes of variability of seasonal mean temperatures were analyzed for a number of European stations. Such changes are found to occur in organized patterns, which vary in shape according to season. Variability often increases with lower and decreases with higher temperatures, but such relations are not generally valid. Over most of Western Europe, interannual variability of seasonal mean temperature appears to be modulated by the 22 year solar cycle, in such a way that during odd solar cycles variability of winter temperature is higher than during even solar cycles, while for temperatures in summer the opposite is true.
Author (ESA)

N81-31754# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Technology.
RAINFALL PATTERNS IN SOUTH AFRICA, SOUTHEASTERN AUSTRALIA AND NEW ZEALAND
R. G. Vines *In* CNES Sun and Climate 1980 p 55-66 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The relative phases of rainfall fluctuations over the years 1910 to 1977 were determined by filter analysis of data from 100 South African stations. There is a marked coherence of the rainfall figures for different stations, allowing a space averaged precipitation to be derived which is representative of large areas of the subcontinent. A persistent 16 to 20 year wave is widespread over much of South Africa. A shoter term fluctuaion of 6 to 7 years is also presented. The 10 to 12 year wave is similarly widespread, but in Southern South Africa it is out of phase with that observed in the Northeast. There is a striking correspondence between these rainfall patterns for South Africa, and others similarly deduced for the Southeastern mainland of Australia, Tasmania and New Zealand. The 16 to 20 year and 6 to 7 year variations in rainfall remain essentially in phase in all the areas cited. The 10-12 year fluctuation seems to have persisted, for almost 100 years, in maintaining more or less constant phase relationships with the sunspot cycle.
Author (ESA)

N81-31755# Universidad Nacional Autonoma de Mexico, Villa Obregon. Inst. de Geofiscia.
POWER SPECTRA OF THE CLIMATOLOGICAL VARIATIONS IN MEXICO CITY
I. Galindo and J. A. Otaola *In* CNES Sun and Climate 1980 p 67-77 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

A power spectral analysis using a noninteger technique was made of various climatological records in search of periodicities in the data that could be associated to solar activity. Significant oscillations that present clear regional dependences were found. The records from Mexico City show evidence for 11 and 23 yr variations in the annual mean air temperatures, whereas in England the presence of a 12.4 yr variation is the only one that could be ascribed to a possible solar influence. Temperature records from Lisbon only show significant oscillations of 2.2, 3.1 and 5.6 yr for periods less than 10 yr and a predominant one at 26.9 yr for periods greater than 10 yr. Periodicities within the period range 2 yr $< T <$ 10 yr are due to general circulation mechanisms, while those at $T >$ 10 yr are the result of an accumulation of small effects over long periods of time. The advantages of the noninteger technique of spectral analysis over other methods are discussed. Author (ESA)

N81-31756# Centre de Recherches Oceanographiques, Abidjan (Ivory Coast).

HYDRO-CLIMATIC VARIABILITY IN THE EQUATORIAL ATLANTIC CORRELATION WITH SOLAR ACTIVITY

Y. Gallardo *In* CNES Sun and Climate 1980 p 79-86 refs In FRENCH; ENGLISH summary (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

In the eastern equatorial Atlantic, temperature fluctuations on a yearly scale depend principally on a reinforcement-relaxation mechanism of the southern trades similar to that followed by the Peruvian El Nino in the Pacific Ocean. Occurrences of El Nino are shown to correlate with years of late grape harvests, cyclones in the Lesser Antilles and the sunspot number. A spectral analysis of monthly rainfall data from the Congo and of solar activity during 1979 to 1974 show a significant correlation at 4 months and 29 months. Author (ESA)

N81-31757# Saint David's Coll., Kent (England).

THE 200, 22 AND 11 YEAR CYCLES AND LONG SERIES OF CLIMATIC DATA, MAINLY SINCE 200 AD

D. J. Schove *In* CNES Sun and Climate 1980 p 87-100 refs (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

The climatic effects of the 22 and 11 year cycles are usually too small to determine from short meteorological series. Strong and weak solar cycles often have opposite effects and the effects are different in different seasons. Moreover, the year relative to sunspot maximum is significant as the effects are often opposite in odd and even years. Dates and magnitudes of solar cycles since A.D. 300 are determined approximately and can be compared with long series of tree rings, varve, ice core or vintage data. Strong sunspot cycles cause an increase in the pressure parameter, e.g., a fall of pressure in the Indian Ocean and a rise of pressure in the Davis Strait. The pressure parameter phase and the phase of the biennial oscillation can help to determine the phase of the 11- and 22-year cycles in the B.C. era before documentary evidence is available. The 200-year sunspot cycle often affects summer temperature, winter rainfall and perhaps the super oscillation of pressure between the Pacific and Indian Oceans. Author (ESA)

N81-31758# Academy of Athens (Greece). Centre des Recherches d'Astronomie et des Mathematiques Appliquees.

EFFECTS OF THE SOLAR MAGNETIC FIELD ON THE SEMIANNUAL INTENSITY OF THE GREEN CORONAL LINE [EFFECTS DU CHAMP MAGNETIQUE SOLAIRE SUR L'INTENSITE SEMI ANNUELLE DE LA RAIE VERTE CORONALE]

J. Xanthakis, B. Petropoulos (Athens Univ.), and H. Mavromichalaki *In* CNES Sun and Climate 1980 p 101-118 refs In FRENCH; ENGLISH summary (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

A relation is derived for computing the semiannual coronal intensity at 5303A as a function of the solar activity index (area index), the number of proton events and the intensity of the coronal magnetic field. Comparison is made with measured semiannual intensities for solar cycles 19 and 20 showing good agreement. Various terrestrial and solar phenomena are mentioned which can be explained on the basis on the relation. Author (ESA)

N81-31759# National Physical Lab., New Delhi (India).

ROLE OF SOLAR AND NON-SOLAR SOURCES IN CHANGING GLOBAL CLIMATE IN THE PAST SEVERAL HUNDRED YEARS

A. P. Mitra *In* CNES Sun and Climate 1980 p 121-150 refs (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

Solar and nonsolar influences that operate simultaneously or nearly simultaneously to lead to short-term climatic changes are reviewed. The difficulties of identifying solar signatures under these conditions are examined. The period considered is the last few hundred years, especially the last three decades (1950 to 1980). During this time events that could have produced sizable changes in atmospheric minor species of climatic interest are considered. The competing sources are primarily solar UV and proton events and, in the nonsolar category, volcanic eruptions. An approximate quantitative evaluation of their time histories is given. Author (ESA)

N81-31760# Academy of Sciences (USSR), Moscow. Astronomical Council.

THE REALITY OF SOLAR-ATMOSPHERIC RELATIONS AND THE CHANGES OF ATMOSPHERIC CIRCULATION OF SOLAR ORIGIN

E. R. Mustel, V. E. Chertoprud, and N. B. Moulukova *In* CNES Sun and Climate 1980 p 151-161 refs (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

Daily surface pressure differences, geomagnetic storms and geomagnetic moments were correlated for the period 1880 to 1974. Daily pressure differences are used because the characteristic time of the corpuscular-atmospheric interaction is on the order of one to three days, and daily pressure differences are important parameters characterizing atmospheric instability. The variance of the pressure differences were computed along each parallel of interest. The superimposed epoch method is used, applying all available geomagnetic moments for each particular period (season), as well as for the corresponding type of geomagnetic storm. Evidence of the triggering of tropospheric instabilities was sought during local winter in the areas of the strongest temperature gradients near the boundaries of the cold continents and the warmer oceans. Noticeable pressure drops are noted at the locations of the main winter depressions, related to the penetration of corpuscular streams into the magnetosphere. Author (ESA)

N81-31761# Kanagawa Univ., Yokahama (Japan). Inst. of Physics.

QUASI-BIENNAL OSCILLATION OF SOLAR ACTIVITY AND ITS CONTROL OF THE EARTH'S CLIMATE

Kunitomo Sakurai *In* CNES Sun and Climate 1980 p 165-171 refs (For primary document see N81-31749 22-47)

Avail: NTIS HC A21/MF A01

The relative sunspot numbers as the measure of the solar activity show a tendency to vary with a period of about 26 months. This quasi-biennial variations is superimposed on the eleven year change in these numbers, and is also seen the long term variation of the flux of the solar ultraviolet emissions. The cause of this quasi-biennial variation seems to be deeply seated inside the Sun, since the neutrino flux from the Sun varies with a period almost equal to 26 months. This fact strongly suggests that some physical processes must be responsible for the generation of the quasi-biennial oscillation of the solar activity as seen on the solar surface and in the solar atmosphere. The quasi-biennial oscillation of the solar activity seems to produce a similar oscillatory change on terrestrial phenomena such as the mean atmospheric temperature, the ozone content at middle latitude zones and the zonal wind velocity at the equator. It is evident that the quasi-biennial variations of these phenomena are produced by those observed for solar activity. Author (ESA)

N81-31762*# Stanford Univ., Calif. Inst. for Plasma Research.

POSSIBLE INFLUENCE OF SOLAR ROTATION ON TROPOSPHERIC CIRCULATION

John M. Wilcox *In* CNES Sun and Climate 1980 p 173-188 refs (For primary document see N81-31749 22-47)
(Contract NAS5-24420; Grant NGR-05-020-559; Contract N00014-69-A-0200; Grant NSF ATM-77-20580)
Avail: NTIS HC A21/MF A01 CSCL 04B

A large-scale structure observed in the photospheric magnetic field is carried out into the heliosphere by the solar wind. At Earth the resulting interplanetary magnetic field has polarity away from the Sun for several consecutive days followed by an abrupt reversal and several days with field polarity toward the Sun. Low-pressure troughs near the Gulf of Alaska appear to have significantly larger area when the interplanetary field is away from the Sun than when it is toward the Sun. This relation persisted during most of the winters of 1951 to 1973. Surface pressures around the Gulf of Alaska during some winters were in anti-phase for interplanetary field toward and away from the Sun. During the two days after a polarity reversal, the accuracy of the best weather forecasts for the continental United States appears to be significantly lower than at other times. Polarity reversals that are accompanied by energetic interplanetary conditions appear to be associated with a larger decrease in the area of the low pressure troughs. Author (ESA)

N81-31763# Laboratoire de Geophysique Externe du C.N.R.S., St. Maur-des-Fosses (France). Lab. de Geophysique Externe.
THE MAGNETOSPHERE, INTERFACE BETWEEN THE SUN AND THE LOWER ATMOSPHERE [LA MAGNETOSPHERE, INTERFACE ENTRE LE SOLEIL ET LA BASSE ATMOSPHERE]
J. J. Berthelier *In* CNES Sun and Climate 1980 p 189-210 refs In FRENCH; ENGLISH summary (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The magnetosphere and some of the most important magnetospheric phenomena are described. Mechanisms which have been proposed to explain possible magnetospheric influences on meteorological perturbations in the lower atmosphere are presented. The magnetosphere appears to play a role along two directions: it acts first, as a selective screen for high energy particle penetration (solar protons or cosmic rays) and, on the other hand, it transforms a part of the incident solar wind energy and drives its dissipation in the atmosphere. With regard to the solar wind and the interplanetary magnetic field, the interface role of the magnetosphere is infinitely more complex, comprising transformation, storage, and redistribution of the energy, essentially in the form of thermal energy in the ionosphere, also partially as increased ionization in the stratosphere.Author (ESA)

N81-31764# Central Inst. for Weather Forecasting, Budapest (Hungary).
ON THE POSSIBLE EFFECT OF LONG-LASTING ABSENCE OF SOLAR ACTIVITY ON CLIMATIC CHANGES
G. Molnar *In* CNES Sun and Climate 1980 p 211-220 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Periods of prolonged lack of solar activity such as the Maunder or Spoerer minima are discussed. Values of excess solar energy absorbed by the thermosphere are calculated which indicate that the available energy is too low to produce either a direct or a triggering effect on the Earth's atmosphere. The average change of the solar constant during the active period between July 1957 and December 1958, due to transient solar surface phenomena was calculated, and contrasted with the net decrease in the solar constant due to radiation blocking by sunspots. The external manifestations of the solar cycle are concluded to cause no observable change in the tropospheric weather. It can be concluded that greater solar constant variations cannot be in close connection with the known forms of solar activity, which suggest that the possible, significant secular solar luminosity changes, indicated by carbon 14 measurements, could be generated deep inside the Sun and/or could not be closely related to the sunspot cycle. Author (ESA)

N81-31765# A. O. Associates, San Marino, Calif.
SOLAR ACTIVITY AND VARIATIONS OF METEOROLOGICAL PARAMETERS
Allyn H. OMara *In* CNES Sun and Climate 1980 p 221-237 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Evidence for a relationship between variations in meteorological parameters and solar activity is reviewed, and the significance and potential threat of the variations to the biosphere are discussed. Studies of solar magnetic field changes related to vorticity enhancement are surveyed, along with effects of UV radiation on stratospheric ozone concentration. The question is raised whether variations in high-energy solar emissions associated with solar activity could affect stratospheric ozone concentrations, which, combined with supersonic transport emissions, fluorocarbons and other aerosols reaching the stratosphere, could allow an even greater-than-anticipated flux of UV radiation in the 0.3-0.4 micron range to reach the Earth's surface. Author (ESA)

N81-31766# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Lab. Mixte CNRS-CEA.
ELEVEN-YEAR SOLAR CYCLE INFLUENCE ON ATMOSPHERIC EXCHANGES IN THE ANTARCTICA
J. Sanak, G. Lambert, and B. Ardouin *In* CNES Sun and Climate 1980 p 239-258 refs In FRENCH; ENGLISH summary (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Alpha radiation was measured in 5000 filters used to collect aerosols in the atmosphere from 1960 to 1978 in the antarctic. Samples were taken during 6,050 days at Dumont d'Urville Adelie Land. The activity of lead 210 was measured in an ice core taken at the geographic south pole. The core represented snow accumulations since 1890. The aerosol samples show a good correlation with the sunspot number, with increasing concentrations of lead 210 during periods of solar activity. The lead 210 concentrations in the firn layers from the pole is in anticorrelation with the solar cycle, (over 8 cycles). A deep analysis of the results would lead to the conclusion that the solar activity is able to intensity stratosphere-to-troposphere local exchanges. Author (ESA)

N81-31767# Queen Mary Coll., London (England).
LONG TERM VARIATIONS OF THE SOLAR CONSTANT
Ian W. Roxburgh *In* CNES Sun and Climate 1980 p 261-268 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Possible causes of long term variations in the solar luminosity are reviewed, and calculations from several solar models presented. A steady rise in the solar output of 50% over the Sun's lifetime due to the steady conversion of hydrogen to helium, and an instability driven by the buildup over periods of 300 million years of an unstable excess of He-3 away from the center of the Sun are considered. The effect of a change in the properties of turbulent convection giving changes on time scales of hours, months and 100,000 years is discussed. Author (ESA)

N81-31768# Queen Mary Coll., London (England).
THE SOLAR NEUTRINO PROBLEM
Ian W. Roxburgh *In* CNES Sun and Climate 1980 p 269-274 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The problems posed by the low detected flux of neutrinos from the Sun are reviewed. A solar model incorporating a low heavy element abundance and another which assumes that an inner fraction of the total solar mass is kept homogeneous by a mixing process are discussed. The low abundance model, producing the observed neutrino flux contains a helium abundance lower than the universal abundance left from the early fireball phase of the universe. It is difficult to find an acceptable cosmogonical history that would produce such a model. A mixed Sun may be produced by a helium 3 instability caused by the higher temperature sensitivity of helium 3 burning. The slowing down of the Sun by angular momentum loss in the solar wind causing mild turbulent diffusion driven by shear or rotational instabilities may also produce mixing. The possibility of neutrino oscillations and a finite mass for neutrinos is mentioned. Author (ESA)

N81-31769# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
SOLAR LUMINOSITY VARIATION ON DIRECTLY OBSERVABLE TIME SCALES: OBSERVATIONAL EVIDENCE AND BASIC MECHANISMS

Peter V. Foukal *In* CNES Sun and Climate 1980 p 275-293 refs (For primary document see N81-31749 22-47)
(Grant NSF ATM-77-26521)
Avail: NTIS HC A21/MF A01

Rapid changes of radiative flux measured during flares in the X-ray, ultraviolet and radio frequency regions, represent variations of total luminosity below 0.0001 of the solar constant. Radiometry of the solar constant between 1962 and 1980 rules out a luminosity change exceeding 1% over 18 years, at the 95% confidence level. Daily measurements of solar flux carried out at ground level indicate no changes above 0.17% rms between 1926 and 1955, in the wavelength region 0.34 to 2.4 microns. Statistical analysis of the data reveals evidence for transient influence of magnetic fields on solar flux, of delta S/S about 0.0007. Mechanisms which could cause detectable variations of luminosity on short time scales are discussed. Time varying magnetic flux tubes (e.g., sunspots and faculae) are expected to obstruct heat flow to the photosphere, influencing luminosity on time scales of days. Heat flow diversion into kinetic and potential energy of global scale convection can produce variations of convective efficiency on longer time scales. Author (ESA)

N81-31770*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Lab. for Planetary Atmospheres.
STRUCTURAL VARIABILITY OF THE SUN
Sabatino Sofia *In* CNES Sun and Climate 1980 p 295-304 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01 CSCL 04B

Changes in solar radius and luminosity are discussed as a function of age. Surface and satellite observations showing departures from mean solar irradiance on a time scale of a few days are summarized. The most prominent depressions in these data appear to be correlated with sunspot number, indicating that the activity modulation of solar luminosity may be larger than expected. High activity is correlated with low luminosity, but during the Maunder minimum the mini ice age (presumably low luminosity) was accompanied by a near absence of solar activity. Pulsations driven by sources deep within the Sun are thought to be an unlikely cause of luminosity changes, but causes may be sought in the unstable convective zone. Experiments designed to measure the solar radius are mentioned, along with modelling efforts. Author (ESA)

N81-31771# California Univ. at San Diego, La Jolla.
SOLAR ACTIVITY, COSMIC RAY PRODUCED CARBON-14 AND THE TERRESTRIAL CLIMATE
Hans E. Suess *In* CNES Sun and Climate 1980 p 307-310 refs (For primary document see N81-31749 22-47)
(Grant NSF ATM-79-19866)
Avail: NTIS HC A21/MF A01

During the last two periods of unusually quiet Sun, the so-called Spoerrer minimum, A.D. 1400 to 1510, and the Maunder minimum, A.D. 1640 to 1710, the carbon-14 level in the atmospheric carbon dioxide increased by about 2%; during the same periods of time the so-called little ice age occurred. Wood samples suitable for precision carbon-14 measurements are now available for the time back to about 6000 B.C. Throughout this period of time rises of carbon-14 similar to those that had occurred in the 15th and 17th century A.D. can be recognized in the carbon-14 record. There appears to have occurred one such rise every 1000 years, and a second one about every 2200 to 2500 years. Quiet periods of the Sun are assumed to be responsible for these rises and for periods of an elevated carbon-14 activity, but it is not yet possible to say whether or not each such rise reflects a climatic period similar to that of the little ice age. There are indications that appear to support such an assumption. The carbon-14 in tree rings appears to be a promising guide for one study of climatic variations of the past.
Author (ESA)

N81-31772# Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse du C.N.R.S., Orsay (France). Lab. Rene Bernas.
BERYLLIUM-10 AS A POTENTIAL PROBE OF SOLAR VARIABILITY INFLUENCE ON CLIMATE
G. M. Raisbeck and E. Yiou *In* CNES Sun and Climate 1980 p 311-316 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The deposition rate of cosmogenic nuclides at the Earth's surface is dependent on solar activity, through the modulating influence of the solar wind. The concentration profile of these nuclides in various geophysical reservoirs potentially contains a continuous record of solar activity in the past. The technique of accelerator spectrometry offers the possibility of measuring long lived radionuclides such as Be-10 with orders of magnitude greater sensitivity than previously available. Be-10 measurements in ice cores taken at Dome C in the Antarctic are described. The data are not inconsistent with an enhanced Be-10 concentration during the Maunder minimum. Since such ice cores also retain a record of climate events (by means of stable isotope ratios), such an investigation potentially offers an ideal possibility of correlating climate and solar variability. Author (ESA)

N81-31773# Centre National d'Etudes Spatiales, Paris (France).
FORMATION OF THE EARTH AND ALTERATION OF THE CLIMATE
A. Kitov *In its* Sun and Climate 1980 p 317-323 ref (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Effects upon planetary atmospheric circulation attributed to processes which occurred during mass accretion leading to formation of the planets is postulated. Differential circulation of the atmosphere is discussed in the context of asymptotic alterations of the climate and quasi-periodic variations of the climate. Author (ESA)

N81-31774# Universite Catholique de Louvain (Belgium). Inst. of Astronomy and Geophysics.
A CRITICAL REVIEW OF MODELING OF THE ASTRONOMICAL THEORY OF PALEOCLIMATES AND THE FUTURE OF OUR CLIMATE
A. Berger *In* CNES Sun and Climate 1980 p 325-355 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Recent objective comparisons in the time and frequency domains between ice volume, paleotemperature and insolation variations during the Quaternary, strongly suggest an analogy between the trends of these curves. This is interpreted as an evidence in favor of the generalized Milankovitch astronomical theory of climate change. Some attempts to establish the mechanisms by which the climatic system responds to external disturbance (variations of the orbital elements) are reviewed. Most of the models, with orbital forcing, predict that the general cooling that began some 6,000 YBP will continue over the next 25,000 years at least. Astronomical and insolation climate indexes, which also simulate the timing and the relative amplitude of gross paleoclimatic indicators during the last 250,000 years, show that the first cold peak will arrive 5,000 YAP and will be followed by an amelioration around 15,000 YAP, a cold interval centered 23,000 YAP and a major glaciation at around 60,000 YAP.
Author (ESA)

N81-31775# Royal Netherlands Meteorological Inst., De Bilt.
LINKING ICE SHEET EVOLUTION TO MILANKOVITCH RADIATION VARIATIONS: A MODEL SIMULATION OF THE GLOBAL ICE VOLUME RECORD
J. Oerlemans and J. M. Bienfait *In* CNES Sun and Climate 1980 p 357-368 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

In model studies of the astronomical ice-age theory, snow/ice melt has frequently been set proportional to summer insolation and/or mean surface air temperature. A simple energy-balance model of the ice/snow surface layer, which simulates the daily cycle is used to investigate this point. Imposing the Milankovitch solar radiation variations for the last 200 ka (1 ka = 1000 years) shows that melting rates can be parameterized in terms of absorbed solar radiation. In terms of latitude, melting rates shift over 10 deg., while summer insolation shifts over about 14 deg. This difference stems from the fact that the amplitude of the daily cycle decreases with latitude. The results of the ice/snow melt model is used to parameterize the mass balance of a dynamical model of a Northern Hemisphere ice sheet. Forcing of this model with the Milankovitch insolation variations gives a very reasonable simulation of the global ice volume record of the last 700 ka. As in the oxygen isotope

record, the dominant signal in the model output is a 100 ka periodicity. The asymmetry of the 100 ka cycle is very well reproduced. Author (ESA)

N81-31776# Harvard Univ., Cambridge, Mass. Center for Earth and Planetary Physics.
THE CHANGING ATMOSPHERE: ITS ROLE IN CLIMATE
M. B. McElroy *In* CNES Sun and Climate 1980 p 369-383 refs (For primary document see N81-31749 22-47)
(Grant NSF ATM-79-13251)
Avail: NTIS HC A21/MF A01

The occurrence of climatically significant changes in atmospheric composition on time scales ranging from years to hundreds of thousands of years is put forward. Mining and burning of fossil fuel has caused a rise in CO2 from 314 ppm in 1958 to 334 ppm in 1979. Man related stress to the nitrogen cycle has led to an increase in N20 from 293 ppb in 1965 to 301 ppb in 1980 and there are indications for a recent rise in CH4. A change in atmospheric composition even at the ppb level can lead to significant modification of climate. It is argued that CO2 may have varied on time scales of 100,000 years or so in the past reflecting natural fluctuations in the rates for uptake and release of carbon by oceans and sediments. The role of biology as a long term influence on composition is discussed and attention is directed to factors which set Earth apart from its planetary neighbors Venus and Mars. Author (ESA)

N81-31777# Institut d'Aeronomie Spatiale de Belgique, Brussels.
FLUCTUATIONS, SOLAR PERIODICITIES, AND CLIMATIC TRANSITIONS
C. Nicolis *In* CNES Sun and Climate 1980 p 385-404 refs Sponsored in part by Van Buren Foundation (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The time dependent properties of a zero dimensional climatic model, showing bistable behavior and subject both to internal fluctuations and to an external periodic forcing are analyzed. The time dependent solutions of the Fokker-Planck equation are analyzed in order to evaluate the stochastic response to the forcing. The amplitude of the forcing was so small that the deterministic response was negligible. Yet in the presence of fluctuations, the amplitude of the response could change dramatically, depending on two basic quantities: (1) the properties of the climatic potential and (2) a characteristic time scale related to the variance of fluctuations. Under certain conditions the passage over the potential barrier is facilitated and the shape of the probability distribution changes periodically, favoring one of the stable states during certain time intervals. An attempt was made to relate these results to the 100,000 yr periodicity in glaciation cycles. Author (ESA)

N81-31778# Centre National d'Etudes Spatiales, Toulouse (France).
WORKING GROUP 1: STATISTICAL METHODS
G. derMergreditchian *In* CNES Sun and Climate 1980 p 407-409 Partly in FRENCH and ENGLISH (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The problems of data quality, choice of appropriate statistical tools and interpretation of results were discussed. The importance of measurement precision, proper sampling and detection of spurious data are mentioned. The need for examining the physical causality between variables showing statistical correlation is stressed. Robust tools are preferred over methods which may be more powerful but which require more restrictive hypotheses. Validation of findings obtained by statistical means with results given by other methods is always preferable.
Author (ESA)

N81-31779# National Physical Lab., New Delhi (India).
WORKING GROUP 2: PHYSICAL MECHANISMS
A. P. Mitra *In* CNES Sun and Climate 1980 p 411-416 (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The speculative nature of many proposed solar Sun/climate relationships is addressed. Quantitative estimates, where posible, as in the case of minor species in the stratosphere, are especially difficult to make for events in the past, and the entire Sun-stratosphere-troposphere link has rarely been quantitatively examined either generally or for specific events. For long timescale phenomena, an important mechanism appears to be the Milankovitch hypothesis for which some sound theoretical basis has become available. For short timescale phenomena, the picture is less clear. Possible mechanisms include any changes in solar constant (if such changes do indeed exist) the variation in the UV with solar activity, the role of energetic particles, and the role of global atmospheric electrical circuits. Author (ESA)

N81-31780*# National Aeronautics and Space Administration, Washington, D. C.
WORKING GROUP 3: SPACE MEASUREMENTS
S. I. Rasool *In* CNES Sun and Climate 1980 p 417-420 (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

Solar variability regarding spectral irradiance, with significant variations in the extreme UV and at cm wavelengths and changes in total luminosity were discussed. The question of time scales of solar variations and the problem of establishing past variability were raised, since direct measurements of variability have begun. Enough data have been acquired to begin intercomparison of results, review of different techniques and interaction with theoreticians. The need to establish solar variability as a function of time scale and spectral domain and to relate this variability with such indices as sunspot number, radio flux (10.7 cm), solar diameter, photospheric temperature was addressed. The need for continued long term solar measurements, ozone measurements, stratospheric and mesospheric temperatures and stratospheric trace species was stressed. Author (ESA)

N81-31781# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France).
AN INSTRUMENT TO MEASURE THE SOLAR SPECTRUM FROM 170 TO 3200 MM ON BOARD SPACELAB
G. Thuillier, P. C. Simon (Inst. d'Aeronomie Spatiale de Belgique), D. Labs (Landessternwarte auf dem Koenigstuhl), R. Pastiels (Inst. d'aeronomie Spatiale de Belgique), and H. Neckel (Hamburger Sternwarte) *In* CNES Sun and Climate 1980 p 421-430 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

The instrument includes three double monochromators of 10 cm focal length using concave holographic gratings. The absolute solar spectral irradiance is measured in the wavelength interval 180 to 3200 nm, to detect long term variations. Photomultiplier tubes and a PbS cell are used as detectors. The spectrometers have bandpasses of 1 nm up to 900 nm and 20 nm from 850 to 3200 nm with an accuracy of 0.01 nm. Calibration lamps are included in the instrument to monitor any change in its sensitivity and wavelength scale. Tungsten ribbon, deuterium, and helium-filled hollow cathode lamps are used. Calibration techniques, including the long term standard (half a solar cycle) are summarized. The final precision of the instrument is 0.3%. Author (ESA)

N81-31782# Centre d'Etudes et de Recherches Geodynamiques et Astronomiques, Grasse (France).
APPLICATION OF RADIATION PRESSURE MEASUREMENTS TO THE MONITORING OF THE SOLAR CONSTANT
Y. Boudon and A. M. Mainguy (ONERA, Paris) *In* CNES Sun and Climate 1980 p 431-443 refs In FRENCH; ENGLISH summary (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01

A satellite-borne accelerometer is proposed for measuring the direct radiation pressure of the Sun and thus the solar constant. During the four year lifetime of the Castor the acceleration due to radiation pressure was measured with a precision of 1% by statistical means. An improved system carried on the BIRAMIS satellite uses an accelerometer Super Cactus with a sensitivity of 10 to the minus 6th power to 10 to the minus 10th power m/sec sq. The satellite acts as a wide field (4 pi steradians) radiometer integrating the radiation spectral densities over all wavelengths. The methods used for the processing of the CASTOR satellite data can be improved for the BIRAMIS satellite for the measurement of the solar constant, with a precision of the order of 0.1% on the relative variations Author (ESA)

N81-31783*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Lab. for Planetary Atmospheres.

A REVIEW OF OBSERVATIONAL EVIDENCE FOR SHORT AND LONG TERM ULTRAVIOLET FLUX VARIABILITY OF THE SUN

Donald F. Heath *In* CNES Sun and Climate 1980 p 447-471 refs (For primary document see N81-31749 22-47)
Avail: NTIS HC A21/MF A01 CSCL 04B

Observation of the Sun in the 160 to 400 nm wavelength region reveals no significant broadband variation with solar flares, variability associated with the rotation of active regions, and a possible long term change which may be related to the 11 year sunspot cycle or longer. A continuing ultraviolet solar flux variability below 200 nm was observed from 1969 through the present from satellites, which is modulated at solar rotation rates. Recent observations from Nimbus-7 show the solar flux is varying by significant amounts also in the regions from 200 nm up to the Calcium 2 H-line at 396.8 nm. Typically the flux may vary over a solar rotation from about 10 percent at 160 nm to slightly less than 1 percent at the Ca2 K-line. Results of an evaluation of observations from rockets, satellites, and the ground measurements are discussed. Author (ESA)

N81-31784# Naval Postgraduate School, Monterey, Calif.

DEVELOPMENT OF A PROTOTYPE NORTH PACIFIC OCEAN SURFACE VISIBILITY CLIMATOLOGY STRATIFIED BY OBSERVATIONS TIMES M.S. Thesis

Thomas Norman Talbot and Robert J. Renard Jun. 1981 86 p refs
(AD-A102374; NPS63-81-002) Avail: NTIS HC A05/MF A01 CSCL 04/2

This study develops a prototype surface visibility climatology for the North Pacific Ocean. Data were extracted from the National Climatic Center's historic files and represent a 20-year (1954-1973) period. The area of study is bounded by latitudes 20 deg N and 70 deg N and longitudes 120 deg E and 110 deg W. Experiments concerning the implementation and modification of an objective processing and analysis routine are briefly described. Select Greenwich Mean Time and Local Standard Time (LST) visibility analyses and their standard deviations for January, April, July and October are developed from a data base of nearly 1.6 million transient ship observations. Each set is analyzed for the diurnal variation of visibility at sea. The LST analyses are found to be unacceptable for use in the investigation of diurnal visibility changes due to an intermediate synoptic time low-visibility bias. Marine fog frequencies from a 10-year period (1967-1976) are shown; they compare favorably with the visibility analyses for comparable time periods. GRA

N81-31785# Colorado State Univ., Fort Collins.

FURTHER ANALYSIS OF TROPICAL CYCLONE CHARACTERISTICS FROM RAWINSONDE COMPOSITING TECHNIQUES Final Report

William M. Gray Mar. 1981 136 p refs Sponsored in part by NSF and NOAA
(Contract N00228-76-C-2129)
(AD-A102053; NEPRF-CR-81-02) Avail: NTIS HC A07/MF A01 CSCL 04/2

Up-to-date results of recent tropical cyclone research at Colorado State University are presented. Particular attention is paid to new findings which impact on tropical cyclone analysis and forecasting efforts. Observational studies using large amounts of composited rawinsonde, satellite, and aircraft flight data have been performed to analyze tropical cyclone formation, diurnal variability of tropical cyclones, tropical cyclone intensity change, statistical validity of rawinsonde compositing philosophy, and tropical cyclone looping motion. Author (GRA)

N81-31786# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.

IMPROVED WEATHER SERVICES FOR HELICOPTER OPERATIONS IN THE GULF OF MEXICO Final Report

Arthur Hilsenrod Jun. 1981 85 p
(AD-A102209; FAA-RD-81-40) Avail: NTIS HC A05/MF A01 CSCL 04/2

Current weather services in support of the more than 800 helicopters operating in the Gulf of Mexico is reviewed and the limitations noted. Means of improving these services based on currently available facilities and ongoing research and development efforts are presented. Immediate improvements in weather services can be attained by the implementation of a plan agreed upon by personnel of the FAA, NWS and helicopter operators. Near-term (to 1986) and longer-term (beyond 1986) developments in observations, forecasts, and communications that can improve weather services are presented. Author (GRA)

N81-31787# Federal Aviation Administration, Washington, D.C. Technical Center.

DISSEMINATION OF WEATHER INFORMATION IN THE AIR TRAFFIC CONTROL SYSTEM Final Report, period ending Nov. 1980

R. Craig Goff, P. Wayne Willoughby, and George Baboza Jun. 1981 19 p refs
(FAA Proj. 151-413-420)
(AD-A102027; FAA-CT-81-44; FAA-RD-81-47) Avail: NTIS HC A02/MF A01 CSCL 17/7

This report addresses the present day methods of disseminating weather information in the Air Traffic Control System. The report is based on the information gathered during visits to various air traffic control facilities by a Federal Aviation Administration Technical Center team. The team responsibility was to observe and analyze weather dissemination methodologies and to interview involved personnel. Based on the data gathered and the problems identified, recommendations are made which can be implemented in the near-term (9 to 12 months). These recommendations, if adopted, may require some modification or redirection of current orders defining weather dissemination procedures. Also included are recommendations for purchase of new, but off-the-shelf, automating equipment which should aid in the timely deliverance of needed weather products to the users. A trip report, noting observed facility-by-facility dissemination problems, is included as appendix A. Author (GRA)

N81-31788# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

MAUI OPTICAL SITE, MOUNT HALEKUALIA, HAWAII. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS C, E AND F Final Report

23 Mar. 1981 459 p
(AD-A102394; AD-E850087; USAFETAC/DS-81/048) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Maui Optical Site, Mt Halekualia, Hawaii. It contains the following parts: (A) Weather Conditions, Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts, and extreme values); (C) Surface winds; (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N81-31789# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

PATRICK AFB, COCOA BEACH, FLORIDA. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

14 Apr. 1981 435 p
(AD-A102396; AD-E850083; USAFETAC/DS-81/050) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six-part statistical summary of surface weather observations for Patrick AFB, Cocoa Beach, Florida. It contains the following parts: (A) Weather Conditions; Atmospheric Phenomena; (B) Precipitation, Snowfall and Snow Depth (daily amounts, and extreme values); (C) Surface winds, (D) Ceiling versus Visibility; Sky Cover; (E) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb

temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N81-31790# Argonne National Lab., Ill.
NUMERICAL SIMULATION OF MESOSCALE ATMOSPHERIC CIRCULATIONS OVER THE LAKE MICHIGAN AREA
Tetsuji Yamada 1980 25 p refs Presented at the ASME Winter Ann. Meeting, Chicago, 16-21 Nov. 1980
(Contract W-31-109-eng-38)
(CONF-801102-38) Avail: NTIS HC A02/MF A01

Results show airflow characteristics similar to those often observed in the area under late summer conditions. The model sensitivity studies confirm that intensity and location of the lake breeze circulations can vary considerably, for example, if synoptic winds change. Magnitudes of the computed eddy exchange coefficients over water are considerably smaller than the counterparts over land. DOE

N81-31791# AeroVironment, Inc., Pasadena, Calif.
ASSESSING THE LOCAL WINDFIELD WITH INSTRUMENTATION
T. G. Zambrano Oct. 1980 281 p refs Prepared for Battelle Pacific Northwest Labs., Richland, Washington
(Contract DE-AC06-76RL-01830)
(PNL-3622) Avail: NTIS HC A13/MF A01

A technique for the initial screening and evaluation of potential sites for wind energy conversion systems (WECS) was examined. The siting exercise involved measurements of winds along the surface and winds aloft using a relatively new instrument system, the tethered aerodynamic lifting anemometer (TALA) kite; notation of ecological factors such as vegetation flagging, soil erosion and site exposure, and verification of an area best suited for wind energy development by establishing and maintaining a wind monitoring network. The siting exercise was carried out in an approximately 100 square mile region. It is shown that a comprehensive site survey involves field measurements, ecological survey, and wind monitoring is an effective tool for preliminary evaluation of WECS sites. DOE

N81-31792# Battelle Pacific Northwest Labs., Richland, Wash.
SOME ASPECTS OF FLUCTUATING VERTICAL WIND SHEARS
J. C. Doran May 1981 29 p refs
(Contract DE-AC06-76RL-01830)
(PNL-3771) Avail: NTIS HC A03/MF A01

Fluctuating vertical shears of wind speed were measured using an array of towers. The statistical distributions of these shears are compared with Fichtl's formulas. A comparison of Fichtl's formula for the standard deviation of the fluctuating shears with the more empirical one by Ramsdell shows that the latter is consistent with the former. The probability of occurrence of extreme shears in speed is discussed. Fluctuating shears in speed is discussed. Fluctuating shears two or more times larger than the mean values are shown to be readily obtainable, and their likelihood increases as the mean measuring height increases if (RADICAL) Z is held fixed. DOE

N81-31793# Rolls-Royce Ltd., Derby (England).
INVESTIGATION OF TURBULENCE ACCORDING TO FLUCTUATING RADIO REFLECTIONS
V. V. Sidorov, A. N. Fakhrutdinova, and T. S. Ivanushkina 1981 8 p refs Transl. into ENGLISH from a rept. from Kazan State Univ. (USSR) In RUSSIAN and ENGLISH
(PNR-90063; TRANS-15522; TLT-00814) Avail: NTIS HC A02/MF A01

The destruction of meteor trails by atmospheric turbulence is modelled and the use of reflected radio amplitude fluctuations in measuring turbulence is examined. The trail is assumed to be vertical and illuminated by a wave which strikes it horizontally. The characteristics of turbulence are deduced from fading parameters which are obtained by experiment such as the probability of fading as a function of time. Comparing the measured mean appearence of fading and multiple beam delay probability with the theoretical evaluation based on the proposed pattern of destruction of the meteor trail shows good agreement. Author (ESA)

N81-31794# Water and Power Resources Service, Denver, Colo. Office of Atmospheric Resources Research.
PROJECT SKYWATER DATA INVENTORY: SCPP SEASON, SIERRA COOPERATIVE PILOT PROJECT
Jul. 1980 199 p
(PB81-185803) Avail: NTIS HC A09/MF A01 CSCL 04B

This report contains an inventory of all data collected from November 1979 to April 1980 in association with the SCPP (Sierra Cooperative Pilot Project). The SCPP is a weather modification research project in winter orographic cloud seeding. GRA

N81-31795# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
MARINERS WEATHER LOG, VOLUME 24, NUMBER 6, NOVEMBER-DECEMBER 1980
Elwyn E. Wilson Dec. 1980 82 p
(PB81-195372; NOAA-81020402) Avail: NTIS HC A05/MF A01 CSCL 04B

Marine technology developments are reported. The Marine Weather Review and the Marine Diary are updated. The 1979-80 Great Lakes ice season was reviewed and a new daily oceanographic analysis system is described. T.M.

N81-31796# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
MARINERS WEATHER LOG, VOLUME 25, NO. 1
Elwyn E. Wilson Feb. 1981 74 p refs
(PB81-195414; NOAA-81021302) Avail: NTIS HC A04/MF A01 CSCL 04B

Hints to the observer, tips to the radio officer, marine observations program, hurricane alley, on the editor's desk, marine weather review, and marine weather diary are presented. GRA

N81-31797# Environmental Protection Agency, Research Triangle Park, N.C.
DEPENDENCE OF NEPHELOMETER SCATTERING COEFFICIENTS ON RELATIVE HUMIDITY, EVOLUTION OF AEROSOL BURSTS
George W. Griffing May 1981 38 p refs
(PB81-198293; EPA-600/4-81-030) Avail: NTIS HC A03/MF A01 CSCL 04B

Observations on the temporal dependence are presented and discussed for four different cases. For each case, the weather was dominated by an anticyclonic weather system. By taking simultaneous nephelometer scattering coefficient observation at two different relative humidities, it was possible to conclude that with nocturnal stable atmospheric conditions: In general, the scattering coefficient increases from sundown to sunup due to aerosol growth and an increasing trend of the aerosol number density: In general, the relatively rapid increase and subsequent decrease of the scattering coefficient during a 2 to 3 hour period after sunup is due to a relatively rapid aerosol growth and shrinkage. The latter behavior of the scattering coefficient was called a aerosol burst. GRA

N81-31798# National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
CONVECTIVE CLOUD MODIFICATION POTENTIAL IN ILLINOIS COMPARED WITH THAT FOR SOUTH FLORIDA AND DEDUCED FROM SOUNDINGS AND CLOUD PHYSICS MEASUREMENTS
Victor Wiggert, Robert I. Sax, and Ronald L. Holle Jun. 1980 79 p refs
(PB81-198681; NOAA-81031704; NOAA-TM-ERL-NHEML-8) Avail: NTIS HC A05/MF A01 CSCL 04B

The potential for enhancing rain output over central Illinois through modification of summertime convective clouds was investigated. Model predictions of cumulus growth and internal measurements of cloud physical characteristics were used with

similar studies for south Florida. The growth of unseeded and seeded clouds was predicted numerically with a one dimensional cumulus model. In Florida, seedability is correlated with actual increases in vertical growth and enhanced rain output of individual clouds, following seeding. For the Illinois environment, a climatology of seedabilities, derived from radiosonde data regularly gathered during 10 summers was assembled. Cumuli are found in the Illinois environment that were amenable to artificial modification as those found in south Florida. GRA

N81-31799# National Weather Service, Honolulu, Hawaii. Pacific Region Office.
TROPICAL CYCLONES (1980): CENTRAL PACIFIC
Andrew K. T. Chun Mar. 1981 13 p
(PB81-198699; NOAA-NWSTM-PR-22; NOAA-81031601) Avail: NTIS HC A02/MF A01 CSCL 04B

Tropic Storm Carmen and Hurricane Kay are described and their tracks are charted. GRA

N81-31800# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
CARBON DIOXIDE, CONDENSATION NUCLEI AND WIND CLIMATOLOGY OF THE BARROW GMCC OBSERVATORY (1973-1979)
Joyce M. Harris (Geophysical Monitoring for Climatic Change, Boulder, Colo.) and Gary A. Herbert (Geophysical Monitoring for Climatic Change, Boulder, Colo.) Nov. 1980 118 p refs
(PB81-198715; NOAA-ERL-ARL-2; NOAA-81031706) Avail: NTIS HC A06/MF A01 CSCL 04B

Barrow, Alaska Observatory carbon dioxode, condensation nuclei and wind measurements are presented. Information about measurements and the instruments used to collect the data are given and a description of Barrow's climate and geography is presented. Two types of presentations are featured: one showing wind speed and direction, the other showing carbon dioxide and condensation nuclei measurements arranged according to wind direction. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N81-31801*# National Aeronautics and Space Administration, Washington, D. C.
OCEANIC LIDAR
Kendall L. Carder, ed. Aug. 1981 45 p refs Workshop presented at Greenbelt, MD., 13-14 Nov. 1980
(NASA-CP-2194) Avail: NTIS HC A03/MF A01 CSCL 08C

Instrument concepts which measure ocean temperature, chlorophyll, sediment and Gelbstoffe concentrations in three dimensions on a quantitative, quasi-synoptic basis were considered. Coastal zone color scanner chlorophyll imagery, laser stimulated Raman temperaure and fluorescence spectroscopy, existing airborne Lidar and laser fluorosensing instruments, and their accuracies in quantifying concentrations of chlorophyll, suspended sediments and Gelbstoffe are presented. Lidar applications to phytoplankton dynamics and photochemistry, Lidar radiative transfer and signal interpretation, and Lidar technology are discussed. E.A.K.

N81-31802# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Sciences.
APPLICATION OF SATELLITE IMAGERY TO THE ASSESSMENT AND EXPLOITATION OF OCEANIC ELECTROMAGNETIC DUCTING M.S. Thesis
Larry Francis Lewis Mar. 1981 49 p refs
(AD-A102309) Avail: NTIS HC A03/MF A01 CSCL 20/14

The nature of the vertical and horizontal properties of the atmospheric refractive index and its effects upon modern electromagnetic systems are described. The methodology and constraints associated with refractive effects prediction in a task force environment are also addressed. Satellite imagery of occurrences of amateur radio tropospheric communications between California and Hawaii is used to identify significant meteorological features of the trans-Pacific ducting environment. Utilization of satellite imagery to provide large scale oceanic synoptic data in conjunction with near real-time refractive effects assessment appear to provide the modern task force commander with the quantitative data required for tactical exploitation of the ducting environment. Author (GRA)

N81-31803# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
INTERPRETATION OF HYDROGRAPHIC FEATURES SEEN IN THE WATERS OFF CAPE COD Final Report. M.S. Thesis
Charles Leonard Reed May 1981 193 p refs
(AD-A102343) Avail: NTIS HC A09/MF A01 CSCL 08/10

A study was conducted to determine the origin of features appearing in a LANDSAT image (1724-14472; 17 July 1974) of the waters off Cape Cod by multitemporal and multispectral analysis techniques. Acquisition of ancillary data supplemented imagery from five different sensors, including visible, near infrared, and microwave, representing fifteen discrete times over a five-year period. Digital data for the LANDSAT image was evaluated multispectrally. Various water reflectance models were applied to the digital data to determine whether features related to reflected light from the ocean bottom, turbidity, or surface reflectance. Parameters were estimated from historical data. Results of model calculations were compared with the observed radiances at several locations in the scene. Multitemporal analysis affirmed that the following detailed information can be determined from space imagery: Rapid rates of coastal change, possible uncharted shoals, and theorized surface manifestations of internal waves. In all cases multisensor imagery increased the reliability of the derived information. Multispectral analysis provided additional evidence for attributing variations of reflectance in deep ocean to the effects of surface reflection and also appears to be the primary cause of reflectivity of patterns over the shoal areas around Nantucket Island. Author (GRA)

N81-31804# Sheaffer and Roland, Inc., Chicago, Ill.
BARRIER ISLAND DEVELOPMENT NEAR FOUR NATIONAL SEASHORES Final Report
Apr. 1981 75 p refs Sponsored in part by Federal Emergency Management Agency, and National Oceanic and Atmospheric Administration, and Dept. of the Interior
(Contract EQ10AC021)
(PB81-196313) Avail: NTIS HC A04/MF A01 CSCL 13B

The development of several communities near Cape Hatteras (North Carolina), Cumberland Island (Georgia), Gulf Islands (Florida and Mississippi), and Padre Island (Texas) National Seashores was analyzed. The impacts of public land acquisition of land values on nearby barrier islands and communities were studied. GRA

N81-31805# National Ocean Survey, Rockville, Md.
TIDE TABLES 1982. HIGH AND LOW WATER PREDICTIONS FOR WEST COAST OF NORTH AND SOUTH AMERICA INCLUDING THE HAWAIIAN ISLANDS
1981 238 p refs
(PB81-199598; NOAA-81032302) Avail: NTIS HC A11/MF A01 CSCL 08C

The Tide Tables, West Coast of North and South America contain full day predictions for 40 reference ports and difference and other constants for about 1,100 stations in North America South America and the Hawaiian Island are presented contain: a table for obtaining the approximate height of the tide at any time, a table of local mean time of sunrise and sunset for every 5th day of the year for different latitudes, a table for the reduction of local mean time to standard time, a table of moonrise and moonset for 6 places, a table of the Greenwich mean time of the Moon's phases, apogee, perigee, greatest north and south and zero declination, and the time of the solar equinoxes and solstices, and a glossary of terms. GRA

N81-31806# National Oceanic and Atmospheric Administration, Seattle, Wash.
AN EMPIRICAL MODEL FOR TIDAL CURRENTS IN PUGET SOUND, STRAIT OF JUAN DE FUCA, AND SOUTHERN STRAIT OF GEORGIA
Carol H. Pease Dec. 1980 43 p
(PB81-197345; EPA-600/7-80-185) Avail: NTIS

HC A03/MF A01 CSCL 08C

The model uses NOS tidal constituents for current measurements from 157 stations from the region and interpolates among them to represent the spatial variation of the region. The spatial interpolation is based on previous identification of areas or family groups of grid points expected to have similar temporal behavior. GRA

N81-31807# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
DRIFTING BUOY DATA FROM THE TROPICAL PACIFIC OCEAN DURING NORPAX EQUATORIAL TEST SHUTTLE EXPERIMENT
Donald V. Hansen, Carol C. Duckett, William Patzert, Gerald McNalley, and Edmund Kerut Sep. 1980 79 p
(Grant NSF OCE-16827)
(PB81-198939; NOAA-TM-ERL-AOML-45; NOAA-81031705) Avail: NTIS HC A05/MF A01 CSCL 08C

The core project of the Test Shuttle experiment was serial CTD and XBT sampling between 20 degrees N and 17 degrees S along 150 degrees W at approximately monthly intervals and weekly AXBT sampling on 150 degrees W and 158 degrees W. These observations were collected between Hawaii and Tahiti, spanning the North Equatorial Current (NEC), the North Equatorial Counter Current (NECC) and the South Equatorial Current (SEC). GRA

N81-31808# National Advisory Committee on Oceans and Atmosphere, Washington, D.C. Task Group on Services to Ocean Operations.
OCEAN SERVICES FOR THE NATION. NATIONAL OCEAN GOALS AND OBJECTIVES FOR THE 1980'S
Victoria J. Jones, ed. Jan. 1981 82 p
(PB81-200602; NACOA-18) Avail: NTIS HC A05/MF A01 CSCL 08J

The goals include: ocean observation and prediction; navigation and positioning, mapping and charting; ocean data and information dissemination; monitoring the ocean; and a new ocean measurement capability. These goals are to provide improved Arctic and Antarctic Ocean information. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N81-31809 Materials Research Labs., Ascot Vale (Australia).
RECORDS OF AUSTRALIAN FOULING ORGANISMS: SESSILE BARNACLES (CRUSTACEA, CIRRIPEDIA)
John A. Lewis Apr. 1981 29 p refs
(MRL-R-809; AR-002-407) Copyright. Avail: Issuing Activity

Ten species of barnacle collected during studies on marine fouling at defense exposure sites in Queensland, New South Wales, Victoria, and Western Australia are described. Morphological and systematic characters of balanomorph barnacles are described and a taxonomic key is presented to enable these important fourling organisms to be routinely identified. E.A.K.

N81-31810*# California Univ., Berkeley. Environmental Physiology Lab.
EFFECTS OF THE COSMOS 1129 SOVIET PASTE DIET ON BODY COMPOSITION IN THE GROWING RAT
Nello Pace, Donald F. Rahlmann, Arthur H. Smith, and Grover C. Pitts 16 Feb. 1981 58 p refs
(Grant NsG-7336)
(NASA-CR-164725; EPL-81-1) Avail: NTIS HC A04/MF A01 CSCL 06C

Six Simonsen albino rats (45 days of age) were placed on a regimen of 40 g/day the semipurified Soviet paste diet used in the 18.5 day Cosmos 1129 spacecraft was to support the rats for various experiments on the physiological effects of weightlessness. The animals were maintained on the Soviet paste diet for 35 days, metabolic rate was measured and body composition was determined by direct analysis. The results were compared with a control group of rates of the same age, which had been kept on a standard commercial grain diet during the same period of time. E.A.K.

N81-31811# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.
RADIATION BIOPHYSICS RESEARCH Annual Report, 1979 - 1980
Mar. 1981 166 p refs
(Contract W-7405-eng-48)
(LBL-11700) Avail: NTIS HC A08/MF A01

Progress is reported from the following research groups and/or areas: research medicine; Donner Pavilion; Peraita Cancer Research Institute; environmental physiology; radiation biophysics and structural biophysics. DOE

N81-31812# Oak Ridge National Lab., Tenn. Chemical Technology Div.
BIOLOGICAL REDUCTION OF NITRATE WASTEWATER USING FLUIDIZED-BED BIOREACTORS
J. F. Walker, Jr., C. W. Hancher, B. D. Patton, and M. Kowalchuk (Goodyear Atomic Corp., Portsmouth, Ohio) 1981 37 p refs Presented at the 3rd Symp. on Biotechnol. in Energy Production and Conserv., Gatlinburg, Tenn., 12-15 May 1981
(Contract W-7405-eng-26)
(CONF-810554-2) Avail: NTIS HC A03/MF A10

There are a number of nitrate-containing wastewater sources in the nuclear fuel cycle as well as in many commercial processes such as fertilizer production, paper manufacturing, and metal finishing. These nitrate-containing wastewater sources can be successfully biologically denitrified to meet discharge standards by the use of a fluidized-bed bioreactor. The major strain of denitrification bacteria is Pseudomonas which was derived from garden soil. In the fluidized-bed bioreactor the bacteria are allowed to attach to 0.25 to 0.50-mm-diam. coal particles, which are fluidized by the upward flow of influent wastewater. A description is given of the results of two biodenitrification R and D pilot plant programs. DOE

N81-31813# Pennsylvania State Univ., University Park. Dept. of Microbiol. and Cell Biol.
MEMBRANE-MEMBRANE INTERACTIONS IN A LIPID-CONTAINING BACTERIOPHAGE SYSTEM Progress Report, 1 Oct. 1980 - 30 Sep. 1981
Wallace Snipes May 1981 8 p refs
(Contract DE-AS02-76EV-02311)
(DOE/EV-03211/32) Avail: NTIS HC A02/MF A01

Virus cell interactions and the mechanism of viral entry are the major focal points of this research. A method of analysis was perfected to investigate the entry process for herpes simplex virus. This technique makes use of a photosensitizing dye, FITC, that convalently binds to viral envelope proteins. Treated viricons remain photosensitive until the envelope is shed during the process of infection. Data strongly support an entry mechanism in which the viral envelope fuses with the cell plasma membrane. Other related projects involved studies of the virucidal properties of retinoids, plaque development characteristics for viruses surviving treatment with membrane perturbers, and a large plaque effect that occurs when virus are plated on cells pretreated with UV light. DOE

N81-31814# Tennessee Univ., Knoxville.
REPAIR AND CELL CYCLE RESPONSE IN CELLS EXPOSED TO ENVIRONMENTAL BIOHAZARDS
Daniel Billen and Charles T. Hadden 1981 14 p refs Prepared in cooperation with Oak Ridge National Lab., Tenn.
(Contract DE-AS05-76EV-04568)
(DOE/EV-04568/T1; ORO-4568-30) Avail: NTIS HC A02/MF A01

Excision and recombination in the repair of damage by 8-methoxypsoralen (8-NOP) in bacillus subtilis was investigated. Topics discussed are: (1) repair of damage by psoralen plus near-UV light; (2) in vitro repair of transforming DNA; (3) photobiology of halogenated DNA; and (4) DNA repair in toluene treated Escherichia coli containing BU DNA. DOE

N81-31815# State Univ. of New York, Brooklyn. Dept. of Radiation Onocology.
BIOLOGICAL EFFECTS OF IONIZING RADIATION AT THE MOLECULAR, CELLULAR, AND ORGANISMAL LEVELS Progress Report, 15 Oct. 1978 - 14 Oct. 1981
Christopher S. Lange Jun. 1981 15 p refs

(Contract DE-AC02-80EV-10503)
(DOE/EV-10503/1) Avail: NTIS HC A02/MF A01

The original Zimm theory of rotor speed dependent DNA sedimentation was tested quantitatively and found to be correct. The quantitative validity of the theory means that the size of a DNA sedimenting under speed-dependent conditions is not undefinable but rather can be uniquely obtained by the application of that theory to the data. The viscoelastic recoil, or more accurately, the zero shear rate reduced recoil is shown to be a quantitative direct function of the number of intact DNA molecules present (per ml) in solution. T.M.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N81-31816* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Aug. 1981 48 p
(NASA-SP-7011(222)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 115 reports, articles, and other documents introduced into the NASA scientific and technical information system in July 1981. Author

N81-31817 Rice Univ., Houston, Tex.
A STATISTICAL INVESTIGATION OF THE PULMONARY EFFECTS OF EXPOSURE OF ASBESTOS Ph.D. Thesis
Edward Neely Atkinson 1981 490 p
Avail: Univ. Microfilms Order No. 8116938

Data collected on a group of 1112 workers formerly employed in the production of insulation containing amosite asbestos at a plant in Tyler, Texas are examined and a subset of continuously employed workers with no other known exposure to asbestos is selected for detailed analysis. The response variables examined are scores for tests of pulmonary mechanics and the explanatory variables are age, height, weight, race, employment history and smoking behavior; the method of analysis is linear least squares regression. The numerical problems associated with presence of strong correlations in the data matrix are considered, and a method for the choice of a subset regression which attempts to alleviate these problems is proposed. Equations for each lung function test are selected and examined in detail. Regression techniques are used to attempt to detect an interactive effect between smoking and asbestos exposure with respect to lung function: such an effect has been reported with respect to carcinoma of the lung. No interactive effect is detected. Finally, maximum likelihood estimation is used to identify a subset of workers who seem particularly susceptible to the effects of asbestos. Dissert. Abstr.

N81-31818# Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
METABOLISM OF HYDRAZINE Final Report, 1 Oct. 1979 - 30 Sep. 1980
F. N. Dost, D. J. Broderick, B. M. Krivak, and D. J. Reed Jun. 1981 16 p refs
(Contract F33615-79-C-0517; AF Proj. 2312)
(AD-A101849; AFAMRL-TR-81-26) Avail: NTIS HC A02/MF A01 CSCL 06/16

In rats exposed to atmospheric hydrazine, the log of blood hydrazine concentration was found to bear a more or less linear relation to atmospheric hydrazine levels. At 20-25 mg hydrazine/cu M, blood concentrations approached 100 nmole/ml, and were about 2 nmole/ml at atmospheric concentrations of about 3 mg/cu M. During exposure, blood concentrations tended to rise rather quickly in the first hour, then oscillated slowly around a generally constant level throughout six hours of exposure. Blood concentration of hydrazine following a single 1 nmole/kg dose decreased with a first phase halftime of about 45 minutes followed by a slower decrease with halftime of 27 hours. Less than one percent of such doses was excreted in bile. In vitro reaction of 5 m molar hydrazine in whole blood proceeded at a rate of about 0.016 micromole/m1/minute or about 10% in 30 minutes. With higher concentrations turnover becomes more rapid and can exceed the hemoglobin subunit equivalence by many fold. Extensive efforts to locate 15N/labelled urinary metabolities that would account for remaining uninventoried hydrazine have not yet succeeded. Author (GRA)

N81-31819# QEI, Inc., Burlington, Mass.
IN SUPPORT OF THE JOINT ARMY/NAVY AIRCREW IMPACT INJURY PREVENTION PROGRAM Annual Report, 17 Oct. 1979 - 15 Dec. 1980
Harvey E. Sbisa and Rodney Thorpe, W. 15 Dec. 1980 14 p
(Contract N00014-78-C-0121; NR Proj. 207-114)
(AD-A102505; IM-151280-1) Avail: NTIS HC A02/MF A01 CSCL 06/5

In one part of this study, research was performed and data collected on the response of the living human to a wide range of impact-accelerative forces applied to the human along various vectors. In this area data bases were reorganized and updated, computer programs were designed, implemented, tested and/or used to maintain, update, search and/or summarize information in these data bases. Motion pictures were digitized, EKG data were processed and a graphical analysis display system was designed and implemented. In the second area, research was performed to determine the effects of ship motions on humans. Performance tests were generated and computer programs were written to edit output from these tests and for analysis of the test outputs. GRA

N81-31820# Strategic Air Command, Offutt AFB, Nebr. Aircraft Engineering Div.
AIRCREW SHIELDING TO FAST NEUTRONS FROM NUCLEAR DETONATIONS Final Report
Rayford P. Patrick 1 Jul. 1981 13 p
(AD-A102239; SAC/LGME-ER-S-115) Avail: NTIS HC A02/MF A01 CSCL 18/6

Future technological advances by enemy nations could compromise the effectiveness of our nuclear hardened manned systems. This study addresses the feasibility of incorporating fast neutron shields into the systems. Such shielding would enhance systems survivability and be very compatible with the use of advanced ECM and bomber defense systems such as missiles, LASERs, and particle beam weapons. It is shown that shielding providing mission completion capability for human aircrews (hence to manned systems) is technically feasible, cost effective, and relatively lightweight. Therefore it is argued that weight and space provisions (at the very least) of such shielding be incorporated into the design of new manned systems. Author (GRA)

N81-31821# Argonne National Lab., Ill. Center for Human Radiology.
TOWARD A THEORY OF THE INITIATION OF CANCER BY IONIZING RADIATION: TRACK STRUCTURE ANALYSIS FOR ELECTRONS AND ALPHA PARTICLES IN WATER
Antonio Pagnamenta (Illinois Univ., Chicago) and John H. Marshall 1980 12 p refs Presented at the 7th Symp. on Microdosimetry, Oxford, UK, 8-12 Sep. 1980
(Contract W-31-109-eng-38)
(CONF-800944-8) Avail: NTIS HC A02/MF A01

Following a method of Kim, differential cross sections were constructed in analytical form for the ionization of water by electrons and alpha particles. By generalizing Wideroe's bookkeeping method the number of higher order delta rays were found. DOE

N81-31822# Oak Ridge National Lab., Tenn.
DOING A RISK ANALYSIS
H. Inhaber 1981 18 p Presented at the 2nd Ann. Eastern Reg. Safety Congr., Philadelphia, 30 Apr. 1981
(Contract W-7405-eng-26)
(CONF-810480-1) Avail: NTIS HC A02/MF A01

The methodologies which can be used to determine the overall risk of any energy system are outlined. Termed risk accounting, it is calculated in analogy to energy accounting, which attempts to determine all the energy inputs into a system in comparison to the net output. The most important conclusion of this analysis is that the risk from non-conventional energy sources can be as high as, or even higher than that of conventional sources. In particular, it tends to be considerably higher than

that of nuclear power, the newest of the conventional sources. The ratio is, in some cases, as high as 10 or 100. The results can be divided into occupational risk, borne by those who construct, fabricate and maintain the energy sources, and danger to members of the public. The total risk of a system is then the sum of occupational and public risk. The occupational man-days lost per unit energy averaged over the system lifetime are given. DOE

N81-31823# Argonne National Lab., Ill. Center for Human Radiobiology.

TOWARD A THEORY OF THE INITIATION OF CANCER BY IONIZING RADIATION. THE TWIN DOUBLET PAIR MODEL

John H. Marshall and Antonio Pagnamenta (Illinois Univ., Chicago) 1980 11 p refs Presented at the 7th Symp. on Microdosimetry, Oxford, UK, 8-12 Sep. 1980

(Contract W-31-109-eng-38)

(CONF-800944-7) Avail: NTIS HC A02/MF A01

Models are proposed which explain the mechanism of action on a molecular level for the initiation of cancer by electrons or alpha particles. DOE

N81-31824# Oak Ridge National Lab., Tenn. Industrial Safety and Applied Health Physics Div.

HEALTH EFFECTS OF LOW-LEVEL RADIATION

John A. Auxier 1981 4 p Presented at the Am. Nucl. Soc. Ann. Meeting, Miami Beach, Fla., 7 Jun. 1981

(Contract W-7405-eng-26)

(CONF-810606-47) Avail: NTIS HC A02/MF A01

The bases for setting and the adequacy of radiation protection standards are reviewed. DOE

N81-31825# Defence Research Information Centre, Orpington (England).

COMPARISON BETWEEN THE HEAT LOSS AND HEAT GAIN THROUGH THE LUNGS AND BODY SURFACE DURING HYPOTHERMIA AND ITS TREATMENT

A. Low and H. Goethe Apr. 1981 29 p refs Transl. into ENGLISH from Intern. Arch. of Occupational and Environ. Health (West Germany), v. 45, 1980 p 231-249

(DRIC-T-6307; BR78676) Avail: NTIS HC A03/MF A01

Treatment of hypothermic patients by means of central body rewarming (CBRW), i.e., through inhalation of warm and humidified air or oxygen, is compared with the classical warm bath treatment in a critical survey of the literature. Heat uptake via the lungs is greater when the inspired air (maximally 45 C) is saturated with water vapor. This heat is transferred totally to the thoracic blood and then to the heart and brain. There, respiratory and vasomotor centres are rapidly stimulated. During warm bath therapy, rectal temperature increases faster but esophageal and tympanic temperatures and thus brain temperature rise slower than during CBRW. In CBRW the dangerous after-drop either does not occur or its effect is minimized, and the danger of a rewarming collapse is nonexistent. Assisted ventilation in CBRW leads to an even more rapid rise in core temperature.

Author (ESA)

N81-31826# Bureau of Radiological Health, Rockville, Md. Div. of Compliance.

AN EVALUATION OF RADIATION EMISSION FROM VIDEO DISPLAY TERMINALS Final Report

Feb. 1981 73 p refs

(PB81-198483; FDA/BRH-81/57; DHHS/PUB/FDA-81-8153) Avail: NTIS HC A04/MF A01 CSCL 13L

The video display terminals (VDTs) to determine emission of ionizing and nonionizing radiation were evaluated. Measurements for ionizing radiation were performed on 125 VDT's; 34 were measured for nonionizing radiation emission. The sources of radiation are discussed, with emphasis on circuit analysis and critical components that may cause radiation. The raiation emission data are reported. Emission values from video display terminals were found to be within existing state, federal, and international guidelines. GRA

N81-31827# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

SIXTH ADVANCED OPERATIONAL AVIATION MEDICINE COURSE

J. Bande, ed. May 1981 103 p refs Partly in ENGLISH; partly in FRENCH Course Held at Brussels, Belgium, 24-28 Mar. 1980

(AGARD-R-681; ISBN-92-835-0293-0) Avail: NTIS HC A06/MF A01

The cardiological problems of selection and screening flying personnel are addressed. The epidemiology and prevention of heart diseases are discussed. Special emphasis is placed on the cardiovascular problems and follow-up of pilots of new generation, high performance aircraft. For individual titles, see N81-31828 through N81-31838.

N81-31828# Cliniques Univ. Saint-Luc, Brussels (Belgium). Service de Cardiologie.

NON-INVASIVE EVALUATION OF THE CORONARY CIRCULATION

Jean-Marie R. Detry and Jacques A. Melin *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 p 1-10 refs (For primary document see N81-31827 22-52)

Avail: NTIS HC A06/MF A01

Coronary artery disease (CAD) is a major medical problem since it is the first cause of mortality and morbidity in the middle aged active population. The early detection of CAD is important since subjects with latent CAD have a much higher incidence of unexpected coronary events as compared to the normal population; as far as occupational medicine is concerned, these subjects should be identified since they may be suddenly incapacitated while on essential duties such as taking off or landing a plane. Among noninvasive diagnostic methods, the role of the history, the value of the exertional ECG and the additional information given by Thallium scintigraphy and radionuclide angiography were examined. T.M.

N81-31829# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

NATO REGULATIONS ON THE CARDIO-VASCULAR SYSTEM

Evrard E. *In its* 6th Advan. Operational Aviation Med. Course May 1981 10 p (For primary document see N81-31827 22-52)

Avail: NTIS HC A06/MF A01

The official regulations are the juridical base of all medical decisions concerning fitness for the flying duties. The regulations are presented for each member country in NATO. All the regulations require the circulatory system to be sound, as checked by clinical, radiological, and electrocadiographic examination. The examination procedures and clinical operations were reviewed and examined as to their validity for current NATO requirements. T.M.

N81-31830# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).

THE APPLICATION OF CARDIOGRAMS IN THE VALUATION OF NAVIGATION PERSONNEL [APPORT DES MECANOGRAMMES CARDIAQUES DANS L'EXPERTISE DU PERSONNEL NAVIGANT]

R. Carre *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 10 p In FRENCH (For primary document see N81-31827 22-52)

Avail: NTIS HC A06/MF A01

Cardiograms provide valuable information for the determination of flight fitness. Several applications of cardiograms are discussed and include: the analysis of the effects of respiration on the cardiovascular system through phonocardiography; the study of arterial distention with the use of carotidograms; and the creation of an index of chronocardiographic measurement for systolic pressure and blood flow. T.M.

N81-31831# Service de Medecine Aeronautique, Versailles (France).

ECHOCARDIOGRAPHY IN AVIATION MEDICINE [ECHOCARDIOGRAPHIE EN MEDECINE AERONAUTIQUE]

G. Leguay and J. Droniou (Service de Cardiologie, Paris, France) *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 8 p In FRENCH (For primary document see N81-31827 22-52)

Avail: NTIS HC A06/MF A01

The principles and techniques of echocardiography are

discussed. The applications of echocardiography in flight examinations are described and include the early detection of heart disease, diagnosis myocardial infarction, and the examination of the cardiac ventricles. Emphasis is placed on the non-invasive aspect of echocardiography. T.M.

N81-31832# Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
PRINCIPAL ELECTROCARDIOGRAPHIC ANOMALIES IN THE VALUATION OF NAVIGATION PERSONNEL [PRINCIPALES ANOMALIES ELECTROCARDIOGRAPHIQUES DANS L'EXPERTISE DU PERSONNEL NAVIGANT]
Raymond Carre *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 8 p In FRENCH (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

The pilots of high performance aircraft undergo many extremes in physiological stress. It is essential to flight safety that the cardiovascular system of a pilot be in top working condition. Electrocardiography provides much of the biomedical data necessary for the valuation of flying personnel. Anomalies in electrocardiographic analysis are discussed and their importance in the overall diagnosis of flying personnel is emphasized. The anomalies include: troubles in analyzing rhythmic variations; the Wolff-Parkinson-White syndrome; the incomplete discription of blockage in right branches of the heart; and the effects of turbulence on ventricular function. T.M.

N81-31833# School of Aerospace Medicine, Brooks AFB, Tex.
TREADMILL TESTING FOR THE DETECTION OF ASYMPTOMATIC CORONARY DISEASE IN THE HEALTHY MALE
James R. Hickman, Jr. *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 9 p refs (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

The poor predictive accuracy of the treadmill test for latent coronary artery disease is discussed. Emphasis is placed on the problem of false positive exercise tests. The treadmill test is regarded as a risk factor and as a part of the total risk factor mosaic rather than as a definitive test for coronary artery disease. Methods that are available for the detection of CAD are presented. T.M.

N81-31834# Service de Sante des Armees, Toulon (France).
CONTINUOUS RECORDING OF THE ECG ACCORDING TO THE HOLTER METHOD [ENREGISTREMENT CONTINU DE L'E.C.G. SELON LA METHODE DE HOLTER]
G. Leguay and A. Seigneuric, (Medecin des Hopitaux) *In* AGARD 6th Advan Operational Aviation Med. Course May 1981 9 p refs In FRENCH (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

The three parts of continuous electrocardiography are discussed: the recording equipment, the reader, and the information system that is utilized to process the data. Applications of ambulatory electrocardiographic monitoring are described. Special problems are highlighted and include arrhythmias in patients with mitral valve prolapse and ventricular arrhythmias due to exercise or myocadial infarction. T.M.

N81-31835# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Dept. of Cardiology.
EPIDEMIOLOGICAL BASIS FOR THE PREVENTION OF CORONARY HEART DISEASE
G. DeBacker (Akademisch Ziekenhuis) *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 7 p refs (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

Coronary heart disease (CHD) is an important cause of premature death and disability in the economically active population of most industrialized countries. Therefore there is a great need for measures to control this mass disease. The controversies concerning links between life styles, behavioral factors and the risk of CHD are discussed. Preliminary results of an ongoing controlled preventive trial are presented. T.M.

N81-31836# Militair Hospitaal Brussel (Belgium).
PREVENTION OF CARDIOVASCULAR DISEASES
H. Kesteloot *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 4 p refs (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

Cardiovascular diseases, especially those caused by coronary heart disease account for 55% of the total death rate in Belgium and are three times more important than cancer. Modern epidemiological research underlined the multifactorial origin of cardiovascular diseases and identified several risk factors. A survey of the most important risk factors influencing cardiovascular mortality is presented. Various recommendations are provided in order to decrease the adverse effects of these risk factors with regard to health and life expectancy. T.M.

N81-31837# Royal Air Force Hospital, Halton (England).
CARDIOVASCULAR PROBLEMS DURING THE PILOTS CAREER
J. N. C. Cooke *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 3 p refs (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

In a population which is highly selected at entry and which is generally composed of the younger age groups in the Air Force the pattern of cardiovascular problems tends to depart from that of the general population. In particular congenital heart disease, valvular disease, and hypertensive heart disease consequent upon chronic renal disease are comparatively rare. The effects of repeated regular physical and ECG examinations of aircrew also tend to produce special problems of the elucidation of presymptomatic cardiovascular disease rather than the mangement of symptomatic patients. The following subjects are discussed: essential hypertension; ischaemic heart disease; arrhythmias; and myocarditis, including sarcoidosis. T.M.

N81-31838# School of Aerospace Medicine, Brooks AFB, Tex.
DISPOSITION OF ELECTROCARDIOGRAPHIC ABNORMALITIES IN AVIATION
James R. Hickman, Jr. *In* AGARD 6th Advan. Operational Aviation Med. Course May 1981 13 p refs (For primary document see N81-31827 22-52)
Avail: NTIS HC A06/MF A01

The present criteria for disposition of electrocardiographic abnormalities in United States Air Force aviators are based upon findings within the flying population and observation of the natural history of specific electrocardiographic findings. The electrocardiogram is a laboratory test requiring a history, physical examination, and other laboratory tests for interpretation. Serial ST and T wave changes, ectopic artrial and ventricular beats, ventricular tachycardia, supraventricular tachcardia, conduction abnormalities such as right and left bundle branch block, Wolff-Parkinson-White electrocardiographic finding, sinus bradycardia, and sinus pauses are discussed. The current aeromedical dispositions for these abnormalities are also discussed. The disposition of certain aeromedical abnormalities will remain flexible and continue to evolve as more experience is gained in dealing with healthy aviators. T.M.

N81-31455# Amsterdam Univ. (Netherlands).
THE EFFECT OF NOISE ON THE VESTIBULAR SYSTEM
W. J. Oosterveld, A. R. Polman (Royal Dutch Airlines, Schiphol), and J. Schoonheyt (Royal Dutch Airlines, Schiphol) *In* AGARD Aural Commun. in Aviation Jun. 1981 5 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

N81-31461# Royal Netherlands Air Force, Soesterberg. Aeromedical Dept.
HEARING STANDARDS FOR AIRCREW
Martin P. C. Gloudemans *In* AGARD Aural Commun. in Aviation Jun. 1981 4 p (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

N81-31469# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).
EFFECTS OF AGE, FLYING TIME AND TYPE OF AIRCRAFT ON THE HEARING OF GERMAN MILITARY PILOTS, AND ITS SIGNIFICANCE FOR INFLIGHT COMMUNICATION
G. R. Froehlich *In* AGARD Aural Commun. in Aviation Jun.

1981 3 p (For primary document see N81-31449 22-35)
Avail: NTIS HC A09/MF A01

N81-31471# Army Aeromedical Research Lab., Fort Rucker, Ala.
HEARING IMPAIRED AVIATORS IN THE U.S. ARMY
Susan Liff and Jerod L. Goldstein *In* AGARD Aural Commun. in Aviation Jun. 1981 3 p ref (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

N81-31472# Ministry of Defence, London (England). Directorate of Civilian Medical Services.
HEARING CONSERVATION
S. Kanagasabay *In* AGARD Aural Commun. in Aviation Jun. 1981 6 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N81-31839 Connecticut Univ., Storrs.
MODELING THE EFFECTS OF SUSTAINED ACCELERATIONS ON PILOT TRACKING PERFORMANCE Ph.D. Thesis
Jonathan Korn 1980 110 p
Avail: Univ. Microfilms Order No. 8116733

Various types of acceleration (G) forces are frequently experienced in fighter aircraft. These forces subject the pilot to physiological and mental stress, that, conceivably, could degrade pilot-vehicle performance. In a laboratory, simulated aerial tracking experiments are a traditional and convenient method of evaluating pilot performance in a G field. In order to complement past experimental research, it is essential to evaluate pilot performance under acceleration stress analytically. The Aerospace Medical Research Laboratory (AMRL) experimental results are analyzed and a normative pilot performance model was developed. This model was validated using the empirical data. Dissert. Abstr.

N81-31840 Temple Univ., Philadelphia, Pa.
THE EFFECTS OF ALTERED SENSORY INPUT ON A SKILLED MOTOR TASK Ph.D. Thesis
Rebecca Lynn Craik 1981 213 p
Avail: Univ. Microfilms Order No. 8115862

The manner in which altered visual input modifies the voluntary motor behavior seen during stair walking was characterized. Precontact muscle activity was diminished and landing was altered for each of the experimental conditions. These results imply that there is adequate time for a sensory perturbation which occurs during the swing phase to alter the subsequent landing. Conclusions from this study are as follows: vision is necessary for optimal stair walking performance; the subject's pre-task execution expectation can alter subsequent motor performance; the relationship between precontact gastrocnemius-soleus muscle activity and the subsequent landing is related to landing strategy; visual information predominates when there is a conflict between visual and other sensory information; and specific visual information is necessary for the input from the visual system to override the other sensory systems.
Dissert. Abstr.

N81-31841# Research Inst. of National Defence, Stockholm (Sweden).
TRAINING FOR RELAXATION. AN EXPERIMENT AT THE MILITARY FLIGHT SCHOOL [AVSLAPPNINGSTRAENING, ETT FOERSOEK VID KRIGSFLYGSKOLAN]
Erland Svensson, Maud Thanderz, and Lars-Eric Unestaahl Feb. 1980 43 p refs In SWEDISH
(FOA-C-59003-H9) Avail: NTIS HC A03/MF A01

A review of psychological training methods is given with emphasis on the use of these methods among athletes and flight crews. Both basic psychological training, including various relaxation methods, and training dedicated to aid specific problems are discussed in terms of increased performance. Relaxation training for exercising adults and elite atheletes is discussed as well as relaxation traning within the Air Force. The results do not reinforce a relationship between relaxation training and altered performance. J.M.S.

N81-31842# New Jersey Inst. of Tech., Newark. Dept. of Electrical Engineering.
DYNAMICS OF TWO-DIMENSIONAL EYE-HEAD TRACKING Final Report
Andrew U. Meyer 15 Jun. 1981 130 p refs
(Grant AF-AFOSR-0114-80; AF Proj. 2313)
(AD-A102369; AFOSR-81-0610TR) Avail: NTIS HC A07/MF A01 CSCL 06/16

Two dimensional target tracking where eye and/or head motion is used for control was examined. A tracking method involving electroculography (EOG) and two tracking schemes using a remote oculometer, one with and one without a visual feedback display was studied. Each tracking method involves eye head coordination. The tests were conducted with human subjects and involved tracking of targets in two dimensional quasirandom motion. All tests were conducted at three different target amplitude levels to study possible nonlinear effects. The frequency response spectrum and a statistical evaluation of the tracking performance were obtained for each tracking run. Average frequency responses are presented for each of three different levels of maximum target field sizes. The overall dynamics of the three tracking methods are represented in compact form of describing function models whose parameters were identified from the averaged frequency responses. E.A.K.

N81-31843# California Univ., Los Angeles. Medical Center.
NEURONAL ADAPTIVE MECHANISMS UNDERLYING INTELLIGENT INFORMATION PROCESSING Final Scientific Report
Charles D. Woody May 1981 58 p refs
(Grant AF-AFOSR-3074-76)
(AD-A101908; AFOSR-81-0574TR) Avail: NTIS HC A04/MF A01 CSCL 05/1

By means of this grant, advances were made in: 1 Identifying key features controlling adaptation in neural networks. 2. Developing and calibrating a device for pressure injection of minute volumes through fine micropipettes. 3. Examining, intracellularly, the response of single cortical neurons to: a. a behavioral unconditioned stimulus used to produce conditioned behavior; b. an unconditioned stimulus produced by direct electrical activation, antidromically, of single, pyramidal tract neurons; and c. direct application of pharmacologic agents thought to cause neural adaptation. 4. Simulating adaptive features of single neurons. 5. Altering rates of acquisition of conditioned behavior by direct neuromodulatory procedures. The results have led to an improved understanding of neuronal adaptive mechanisms underlying intelligent information processing by the brain and afford the design of improve components for use in artificial intelligence. Author (GRA)

N81-31844# Decision Research Corp., Eugene, Oreg.
THE EFFECTS OF GENDER AND INSTRUCTIONS ON CALIBRATION
Sarah Lichtenstein and Baruch Fischoff Jul. 1981 29 p refs
(Contract N00014-80-C-0150)
(AD-A102255; PTR-1092-81-7) Avail: NTIS HC A03/MF A01 CSCL 05/9

Two groups of subjects assessed their confidence in the accuracy of their answers to 200 general-knowledge two-alternative items. One group was given short instructions and the other lengthy instructions. The appropriateness of their confidence, called calibration, proved to be unrelated to both length of instruction and subjects: gender. All but five of the 71 subjects were at least somewhat overconfident; only six could be described as pretty well calibrated. Author (GRA)

N81-31845# Research Inst. of National Defence, Stockholm (Sweden).
SIMILARITY OF DISTORTED PICTURES: ON THE INTERACTION BETWEEN EDGE BLUR AND RANDOM NOISE
Lena Linde Apr. 1981 35 p refs

(FOA-C-53004-H9) Avail: NTIS HC A03/MF A01

The experienced similarity between distorted still pictures was investigated. The distorting stimulus variables, random noise and edge blur were varied according to a factorial design. The digitized scenes were nonfigurative square patterns with two different spatial frequency distributions, and two realistic photographic pictures. The nonfigurative scenes were distorted with three values of each stimulus variable and the realistic scenes with four. The observers rated the similarity of all possible pairs of the nine, or 16 pictures, of each scene. Analyses of the similarity data revealed interactions between the physical variables. Physically constant noise intervals increased subjectively with increasing blur and physically constant blur intervals tended to decrease subjectively with increasing noise. The first interaction was predominant in spatially high frequency scenes, the second in spatially low frequency scenes. Spatially high frequency scenes were characterized by a rapidly varying texture and a large number of edges and the low frequency scenes by slowly varying texture, large homogeneous areas and few details. Author (ESA)

N81-31457# Southampton Univ. (England). Audiology and Human Effects Group.

ASSESSING THE EFFECTIVENESS OF AUDITORY WARNINGS

Peter A. Wilkins *In* AGARD Aural Commun. in Aviation Jun. 1981 13 p refs Sponsored in part by the United Kingdom Health and Safety Executive (For primary document see N81-31449 22-32)

Avail: NTIS HC A09/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N81-31846 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bonn (West Germany). Inst. fuer Flugmedizin.

ON THE APPLICATION OF A TV-MULTIPOINT X-Y TRACKER TO THE MEASUREMENT OF THE TRANSMISSIBILITY OF HUMAN VIBRATION [UEBER DIE ANWENDUNG EINES 'TV-MULTIPOINT X-Y TRACKERS' ZUR BESTIMMUNG DER SCHWINGUNGSUEBERTRAGUNG AUF DEN MENSCHEN]

L. Vogt and E. Schwartz 1980 11 p In GERMAN

Avail: NTIS HC A02

A method for measuring without contact the vibrational response of parts of the human body is described. Pickup probes fixed to the body often lead to interference in the transfer function measurement. An image dissector tube together with a special scanning procedure allow the simultaneous following of three points on a moving object and to register their x and y coordinates at a 5 kHz scanning rate. The technique is applied to the complex head motion of a subject experiencing vertical vibration of 0.35 g between 2 and 19 Hz. Horizontal and vertical transmissibilities are derived and it is shown that the horizontal head motion can attain upto 75% of the vertical motion. Mechanical models for studies of readability of instruments in aircraft are sought. Author (ESA)

N81-31847*# Illinois Univ., Urbana. Coordinated Science Lab.

PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Final Report, Nov. 1975 - Aug. 1981

William B. Rouse Aug. 1981 28 p refs

(Grant NsG-2119)

(NASA-CR-164729; T-106) Avail: NTIS HC A03/MF A01 CSCL 05H

The role of the pilot and crew for future aircraft is discussed. Fifteen formal experimental studies and the development of a variety of models of human behavior based on queueing history, pattern recognition methods, control theory, fuzzy set theory, and artificial intelligence concepts are presented. L.F.M

N81-31848*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RIDE QUALITY METER Patent Application

Jack E. Leatherwood, Sherman A. Clevenson, Thomas K. Dempsey, and David G. Stephens, inventors (to NASA) Filed 22 May 1981 26 p

(NASA-Case-LAR-12882-1; US-Patent-Appl-SN-267179) Avail: NTIS HC A03/MF A01 CSCL 05H

The invention automatically transforms vibration and noise measurements into a single number index of passenger discomfort. The noise measurements are converted into a noise discomfort value. The vibrations are converted into single axis discomfort values which are then converted into a combined axis discomfort value. The combined axis discomfort value is corrected for time duration and then summed with the noise discomfort value to obtain a total discomfort value. T.M.

N81-31849# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

PERSONAL VISUAL AIDS FOR AIRCREW

Jun. 1981 67 p refs Partly in FRENCH and ENGLISH Presented at the AGARD Lecture Series, Paris, 22-23 Jun. 1981 and Fuerstenfeldbruck, West Germany, 25-26 Jun. 1981

(AGARD-LS-115; ISBN-92-835-0292-2) Avail: NTIS HC A04/MF A01

The various conventional modes of optical correction required either by ametropias or by normal or pathological drops in visual acuity were reviewed. Individual brilliance enhancement systems for night flying conditions are discussed. The harmful effects, on the ocular apparatus, of various radiations are described. The means of protection against these various hazards were examined. For individual titles, see N81-31850 through N81-31855.

N81-31850# Service de Sante des Armees, Paris (France). Centre Principal d'Expertisde Medicale du Personnel Navigant de l'Aeronautique

CONVENTIONAL OPTICAL CORRECTION OF AMETROPIAS IN AERONAUTICS [CORRECTION OPTIQUE CLASSIQUE DES AMETROPIES EN AERONAUTIQUE]

P. J. Manent *In* AGARD Personal Visual Aids for Aircrew Jun. 1981 4 p refs In FRENCH (For primary document see N81-31849 22-54)

Avail: NTIS HC A04/MF A01

Visual information obtained by the pilot accounts for the majority of inflight decisions and the overall safety of the flight crew. The various types of ametropias are discussed along with their frequencies of occurance among pilots. Correctional methods are discussed and lens design is emphasized. T.M.

N81-31851# Service de Sante pour l'Armee de l'Air, Paris (France).

THE INDICATIONS OF THE USE OF CONTACT LENSES IN AERONAUTICS [LES INDICATIONS DES VERRES DE CONTACT DANS LA PRATIQUE AERONAUTIQUE]

G. F. Perdriel *In* AGARD Personal Visual Aids for Aircrew Jun. 1981 4 p refs In FRENCH (For primary document see N81-31849 22-54)

Avail: NTIS HC A04/MF A01

Advances in lens design and lens fabrication are discussed. Human tolerance to long term wearing of contact lenses was examined. Examples of successful use of contact lenses in aviation and other activities in high altitude environments are presented. T.M.

N81-31852# Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).

EYE PROTECTION AND TINTED LENSES

In AGARD Personal Visual Aids for Aircrew Jun. 1981 6 p refs (For primary document see N81-31849 22-54)

Avail: NTIS HC A04/MF A01

The effects of ultraviolet, infrared, and visible radiation on the eye are discussed individually with specific reference to the concerns of aviation medicine. Several types of protective lenses, including glass filters, plastic filters, polarizing and polychromatic filters, and graduated filters are examined. Also the advantages and disadvantages of colored and neutral lenses are outlined. M.G.

N81-31853# National Defence Medical Centre, Ottawa (Ontario). Div. of Ophthalmology.
PROBLEMS ARISING FROM THE WEARING OF HEAD EQUIPMENT
Robert E. Forgie *In* AGARD Personal Visual Aids for Aircrew Jun. 1981 7 p refs (For primary document see N81-31849 22-54)
Avail: NTIS HC A04/MF A01

The major problems associated with wearing helmets and oxygen masks are listed. Some of the methods of dealing with the non-optical problems are mentioned. The optical problems are dealt with in more detail and a review of the hypobaric chamber and human centrifuge experiments with soft contact lenses is given together with observations on the use of soft lenses in aircraft. The advantages, disadvantages, complications and limitations of soft contact lenses in military aircrew are discussed briefly with the conclusion that there is a useful if limited role for soft contact lenses in selected military aviators.
Author

N81-31854# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
LASERS AND PROTECTION OF THE EYES
D. H. Brennan *In* AGARD Personal Visual Aids for Aircrew Jun. 1981 13 p refs (For primary document see N81-31849 22-54)
Avail: NTIS HC A04/MF A01

The applications and characteristics of some of the lasers currently available are discussed and these parameters are related to the ocular tissues at risk. The probable visual consequences of laser induced pathology are considered together with the advantages and disadvantages of protective devices. Accident procedures, codes of conduct, and a hazard related examination protocol are also described.
M.G.

N81-31855# Service de Sante pour l'Armee de l'Air, Paris (France). L'Armee de l'Air et du Centre d'Etudes et de Recherches de Medecine Aerospatiale.
PROBLEMS IN AERONAUTICS POSED BY VISUAL DEFICIENCIES [PROBLEMES POSES PAR LES DEFICIENCES VISUELLES EN AERONAUTIQUE]
J. P. Chevalderaud *In* AGARD Personal Visual Aids for Aircrew Jun. 1981 5 p refs In FRENCH (For primary document see N81-31849 22-54)
Avail: NTIS HC A04/MF A01

Techniques in screening flying personnel with vision problems were reviewed. The problems that arise in eye examinations are discussed along with the anatomy of the eye. Special emphasis is placed on anatomical anomalies.
T.M.

N81-31856# Applied Psychological Services, Wayne, Pa.
HUMAN PERFORMANCE IN CONTINUOUS OPERATIONS: DESCRIPTION OF A SIMULATION MODEL AND USER'S MANUAL FOR EVALUATION OF PERFORMANCE DEGRADATION
Arthur I. Siegel, J. Jay Wolf, Anna Marie Schorn, and Halim Ozkaptan (Army Research Inst., Alexandria, Va.) Army Research Inst. for the Behavioral and Social Sciences. Jan. 1981 125 p
(Contract DAHC19-77-C-0054; DA Proj. 2Q1-6374-A-774) (AD-A101950; ARI-TR-505) Avail: NTIS HC A06/MF A01 CSCL 05/8

User instructions and reference materials are presented for a computer simulation model which analyzes the PERFormance Effectiveness of Combat Troops (PERFECT). The model allows analysis of anticipated performance effectivness when variables such as continuous time in battle, light level, enemy/friendly numerical ratio, enemy/friendly terrain advantage, amount of platooning, and amount of sleep permitted are varied alone or in combination. The model is designed for interactive operation at a terminal by a usar with no or minimum sophistication in computer science or computer use. The primary output of the model is tables of personnel effectiveness degradation by day, type of combat unit, and each of five 'combat factors.' Along with interpretive guidance, step-by-step procedures are presented for the preparation of model data and for running the model.
Author (GRA)

N81-31857# Research Inst. of National Defence, Stockholm (Sweden).
MAN AND MACHINE. AN ERGONOMETRIC PERSPECTIVE ON VARIOUS ABILITIES, OBJECTIVES AND WORK PATTERNS IN THE DEVELOPMENT OF THE SYSTEM [MAENNISKA OCH MASKIN. ETT ERGONOMISKT PERSPEKTIV PAA OLIKA KUNSKAPSINTRESSEN, SYFTEN OCH ARBETSMOENSTER VID SYSTEMUTVECKLING]
Hans Furusting Oct. 1979 57 p refs In SWEDISH (FOA-C-56020-H9) Avail: NTIS HC A04/MF A01

Ergonomics is a collective name for activities on various levels (subdisciplinary, disciplinary, or multidisciplinary). The emphasis of ergonomics may be scientific (biotechnical, psychological in technical environments), design or device oriented in a labor context, or humanistic in relation to research into workers' lifestyles and environments. This multiple interpretation, plus the existence of various disciplinary interests and the various perceptions of the role of ergonomics, contributes to competition in the development of a system. In order to discuss points of view and approaches for the development of a system, a model with the following components is introduced: (1) the perception of reality (overriding premises), (2) examples of activity, (3) aspects of viewing the issue and methodology (work patterns), and (4) scope of investigation (study objects and disciplinary interests). The model is tested by applying a few scientific traditions.
J.M.S.

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N81-31858 Illinois Univ., Urbana.
EVALUATION OF NATURAL LANGUAGE PROCESSORS Ph.D. Thesis
Harry Ralph Tennant 1981 253 p
Avail: Univ. Microfilms Order No. 8114488

The difficulties behind evaluating the performance of natural language processors are investigated. An evaluation method that is designed to be systematic and thorough is proposed. The method relies on considering a natural language processor from three viewpoints in the light of several taxonomies of issues relevant to natural language processing. Finally, an evaluation is described of PLANES, a natural language database query system.
Dissert. Abstr.

N81-31859 Illinois Univ., Chicago.
ON SOLVING THE LARGE SPARSE GENERALIZED EIGENVALUE PROBLEM Ph.D. Thesis
John Aruthur Wisniewski 1981 145 p

Avail: Univ. Microfilms Order No. 8114504

An algorithm for solving the large sparse generalized eigenvalue problem Ax = lambda Bx. The matrices A and B are assumed to be symmetric, and haphazardly sparse, with B being positive definite. The problem is treated from a constrained optimization approach and an inverse iteration is developed which requires the solution of linear algebraic systems only to the accuracy demanded by a given subspace. The convergence of the method is discussed, and the rate of convergence is improved by using shifting with the Ritz approximations. Numerical results are presented, and aspects concerning and implementation on a parallel computer are discussed. Dissert. Abstr.

N81-31860 Illinois Univ. at Urbana-Champaign.

EVOLUTIONARY STRUCTURE AND SEARCH Ph.D. Thesis

Roy Frank Rada 1981 169 p

Avail: Univ. Microfilms Order No. 8114463

Major barriers to the design of general purpose evolutionary machines are analyzed. In a constrained problem, evolution is viewed as a search for an optimum in a vast space. Classes of search algorithms are defined, and the performance of each algorithm is related to the structure in search spaces.

Dissert. Abstr.

N81-31861*# EG & G Washington Analytical Services Center, Inc., Riverdale, Md. Planetary Sciences Dept.

PROTOTYPE MICROPROCESSOR CONTROLLER Final Report

J. Zarur and R. Kraeuter Oct. 1980 34 p

(Contract NAS5-25356)

(NASA-CR-166703; EGG-002-80) Avail: NTIS HC A03/MF A01 CSCL 09B

A microcomputer controller for STDN antennas was developed. The microcomputer technology reduces the system's physical size by the implementation in firmware of functions. The reduction in the number of components increases system reliability and similar benefit is derived when a graphic video display is substituted for several control and indicator panels. A substantial reduction in the number of cables, connectors, and mechanical switches is achieved. The microcomputer based system is programmed to perform calibration and diagnostics, to update the satellite orbital vector, and to communicate with other network systems. The design is applicable to antennas and lasers. F.A.K.

N81-31862# Hughes Aircraft Co., Fullerton, Calif.

ELECTRICAL CHARACTERIZATION OF MICROPROCESSOR MEMORIES Final Technical Report, Jun. 1978 - Sep. 1980

Ted Y. Fujimoto Griffiss AFB, N.Y. RADC Jun. 1981 78 p ref

(Contract F30602-78-C-0221; AF Proj. 2338)

(AD-A102305; RADC-TR-81-125) Avail: NTIS HC A05/MF A01 CSCL 09/2

With the advent of microprocessors, considerable design activity has occurred in the development of semiconductor memories as an integral part of the family with the microprocessors. These memories tend to be organized in byte fashion or some submultiple or multiple of the 8 bits. Selected memories of this type have been evaluated and MIL-M-38510 detail specifications written for those devices deemed appropriate. Evaluation consisted of normal dc and ac parameter limit testing, functional tests and electrical characterization studies. The characterization studies included Schmoo plots of selected parameters that were considered critical, including ac timing requirements. The following types of memories were evaluated: Static RAMS, ROM, Fused PROM, Programmable Array Logic, Field Programmable Logic Arrays, Ultraviolet Erasable PROMS, and Electrically Erasable ROMS. Ten detail specifications were written for the foregoing types of parts as follows: Static RAMS - (1) 2147, 2147H, 2114, 2148; (2)6810; (3) 27S07A, 27S03A; (4) ROM - S6831B; (5) PAL (10H8, 12H6, 14H4, 16H2; (6) FPLA - 82S100, 93458; (7) UV/EPROM-2716; (8) TMS 2532; (9) 6654; (10) EAROM-2810, 7810. Author (GRA)

N81-31863# Hughes Research Labs., Malibu, Calif.

HIGH-SPEED GaAs MESFET MEMORY STUDY Final Report, 12 Jun. 1979 - 11 Sep. 1980

M. Waldner and R. E. Lundgren Jul. 1981 69 p refs

(Contract N00173-79-C-0191)

(AD-A102252) Avail: NTIS HC A04/MF A01 CSCL 09/2

A design and analysis study of potential high-speed GaAs MESFET memory circuits was performed. The results show that a 1-kbit static RAM having a 1-nsec access time is feasible. The design of the flip-flop memory cell uses low-power enhancement-mode MESFETs; power dissipation would be 5 microwatts per cell. To achieve maximum memory speed, the peripheral control and drive circuitry uses depletion-mode devices total power dissipation would be about 1 W. Experimental testing and characterization of the memory circuit designs will be performed during the second phase of the program.

Author (GRA)

N81-31864# California Univ., Berkeley. Electronics Research Lab.

THE DESIGN METHODOLOGY OF DISTRIBUTED COMPUTER SYSTEMS Final Report, 30 Jun. 1979 - 31 Dec. 1980

C. V. Ramamoorthy Dec. 1980 46 p refs

(Contract F49620-79-C-0173; Grant AF-AFOSR-05558-81)

(AD-A102065; AFOSR-81-0558TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This is a final report for research in distributed computer systems. Chapter 2 describes top-down development approach. The development process is divided into four successive phases. (1) requirement and specification phase; (2) design phase; (3) implementation phase; (4) evaluation and validation phase. Guidelines and automated tools for the first two phases are developed. A graphical method (using the max. flow min. cut algorithm and cut-tree concept) to decompose and partition a computer system into loosely coupled subsystems is proposed. The implementation and the evaluation and validation phases are outlined briefly only because they are very technology and architecture dependent. Chapter 3 examines Petri net model for asynchronous concurrent systems. Procedures based on Petri net for predicting and verifying the system performance are presented. The computational complexities of these procedures are also shown. Chapter 4 examines the analysis techniques for deadlocks in asynchronous concurrent systems. In particular, we study in detail deadlocks caused by conflicts in mutual exclusive access to resources with the constraint that each resource type has only one member. Chapter 5 first classifies and then evaluates several existing software reliability models according to some proposed criteria. Then it develops a theory of software reliability based on the nature of the input domain of the program, i.e., the size of the errors and the number, complexity and continuity of equivalence classes formed in the input domain.

Author (GRA)

N81-31865# Illinois Inst. of Tech., Chicago.

THE COST EFFECTIVENESS OF MINICOMPUTERS VERSUS MAN FRAMES FOR STRUCTURAL ANALYSIS PROBLEMS, PART 1 Final Report, 1 Jun. 1980 - 31 Aug. 1981

Raphael T. Haftka and Anneliese K. vonMayrhauser 31 Aug. 1981 17 p refs

(Contract N00014-80-C-0364)

(AD-A102265) Avail: NTIS HC A02/MF A01 CSCL 09/2

A study of the cost effectiveness of minicomputers vs. main frames for structural analysis programs is described. It compares the performance of several finite element programs including SAP IV and SPAR. Most of the runs were performed with the Illinois Institute of Technology PRIME 400 minicomputer and the United Computing System UNIVAC 1100/81 main frame. Other computers were used selectively. The matrix of structural problems included beam, plate and shell problems and static, dynamic and nonlinear analysis. Author (GRA)

N81-31866# Illinois Inst. of Tech., Chicago.

COST/PERFORMANCE COMPARISONS FOR PROGRAMS ON DIFFERENT MACHINES, PART 2 Final Report, 1 Jun. 1980 - 31 Aug. 1981

Anneliese K. vonMayrhauser and Dennis E. Witte 31 Aug. 1981 22 p refs Presented at ECOMA-9 Copenhagen, 6-9 Oct. 1981

(Contract N00014-80-C-0364; NR Proj. 064-640)

(AD-A102266) Avail: NTIS HC A02/MF A01 CSCL 09/2

Due to a wide selection of machines with vastly different charging algorithms, the question arises 'which machine is the

most cost-effective'. The program's behavior and the impact on charges on different machines need to be explored. Accuracy and correctness of the results and the system's reliability also need consideration. Human factors influence quality as well. A procedure and system is discussed which evaluates these factors and their relationship with each other. GRA

N81-31867# TRW Defense and Space Systems Group, Redondo Beach, Calif.
JOVIAL (J73) COMPUTER VALIDATOR Final Technical Report, Aug. 1979 - Mar. 1981
Ruth M. Hart and Marilyn S. McClanahan Jun. 1981 103 p
(Contract F30602-79-C-0221; AF Proj. 2532)
(AD-A102386; RADC-TR-81-128) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report describes the results of a project whose goal was to develop a methodology for the systematic testing of compilers. Three major products were developed: a compiler validator for the JOVIAL (J73) programming language, a SEMANOL (76) specification of JOVIAL (J73), and a Test Effectiveness Measurement Facility. In addition, the SEMANOL (76) Interpreter was modified to support this effort. The programming language JOVIAL (J73) was extensively analyzed. Appendix A contains documentation of the SEMANOL specification, Appendix B contains a listing of the SEMANOL specification, and Appendix C contains revised documentation for the SEMANOL Interpreter. Additional details on the Validator and the Test Effectiveness Measurement Facility can be found in their respective Users Manuals. Author (GRA)

N81-31868# Teledyne Brown Engineering, Huntsville, Ala. Systems Div.
ADVANCED MULTIPLE PROCESSOR CONFIGURATION STUDY Final Report
S. J. Clymer May 1981 121 p refs
(Contract F33615-79-C-0003; AF Proj. 6114)
(AD-A101919; AFHRL-TR-80-43) Avail: NTIS HC A06/MF A01 CSCL 09/2

The overall objective of this study was to provide the Air Force with techniques for determining the effect of alternative multiple processor configurations on training simulator performance. This report summarizes the analysis and presents the baseline set of techniques identified by this study. Recommendations are made concerning the adaptation of these techniques for computation subsystem designs prior to their prototype development. Author (GRA)

N81-31869# Los Alamos Scientific Lab., N. Mex.
BULK-MEMORY PROCESSOR FOR DATA ACQUISITION
R. O. Nelson, D. E. McMillan, J. W. Sunier, M. Meier, and R. V. Poore 1981 5 p refs Presented at the Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Oak Ridge, Tenn., 28-30 May 1981
(Contract W-7405-eng-36)
(LA-UR-81-1568; CONF-810523-4) Avail: NTIS HC A02/MF A01

A bulk memory system was implemented which includes a fast and flexible processor. This bulk processor (BMP) utilizes bit slice and microcode techniques and features a 24 bit wide internal architecture allowing direct addressing of up to 16 megawords of memory and histogramming up to 16 million counts per channel without overflow. The BMP is interfaced to the MOSTEK MK 8000 bulk memory system and to the standard MODCOMP computer I/O bus. Coding for the BMP both at the microcode level and with macro instructions is supported. DOE

N81-31870# Fondazione Ugo Bordoni, Rome (Italy).
THE UTILIZATION OF MICROPROCESSORS IN REAL TIME NUMERICAL SIGNAL PROCESSING [L'IMPIEGO DEI MICROPROCESSORI NELL'ELABORAZIONE NUMERICA DEI SEGNALI IN TEMPO REALE]
Giuseppe Guarrera and Vincenzo Fama Jun. 1979 36 p In ITALIAN
(FUB-49-1979) Copyright. Avail: NTIS HC A03/MF A01

The implementation of digital filters using an MCS-80 microcomputer (microprocessor Intel 8080A) is described. Data acquisition is based on an independent clock analog to digital conversion. The asynchronous converter may call the microcomputer once the sample conversion is completed. A memory mapping technique was used for the interface with the microcomputer. The converter is complemented by sampling, holding and timing blocks. The data processing software to implement a sinusoidal digital oscillator at 1500 Hz with a sampling period of 87 microseconds is detailed to illustrate the system applications. No RAM memory utilization is required. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N81-31871 Michigan Univ., Ann Arbor.
SYNCHRONIZATION: A FORMAL APPROACH Ph.D. Thesis
Janice Emily Cuny 1981 198 p
Avail: Univ. Microfilms Order No. 8116220

A formal framework in which synchronization, specific synchronization problems and synchronizing constructs can be defined precisely is presented. The formal framework consists of a general model of concurrent computation together with a formalization of the concept of simulation. The model of concurrent computation differs from previous models in that synchronizing constraints are applied to sequences of operations, rather than to single operations. This allows the accurate representation of high level nonatomic constructs such as monitors and serializers in fact, all common synchronizing constructs can be given precise, uniform definitions terms of this model. The formalization of simulation as a behavior preserving mapping between systems is used to compare synchronization across systems. It differs from previous formalizations in its more realistic treatment of process blocking. Dissert. Abstr.

N81-31872 New York Univ., N. Y.
CIRCLE GRAPHS Ph.D. Thesis
Mark Alan Buckingham 1981 148 p
Avail: Univ. Microfilms Order No. 8115533

Many mathematical and algorithmic aspects of circle graphs are discussed. The number of different circle with chords representations that yield a chordless path is given. The property that a circle with chords is connected (that is, its derived circle graph is connected) and the property that a circle with chords has two separated chords (that is, two chords that cannot both be intersected by a third chord without the third intersecting a fourth chord) are described in terms of circle graph sequences. They are found to be dual to one another. An incomplete forbidden subgraph characterization of circle graphs is also presented. The Berge Strong Perfect Graph Conjecture is shown to hold for the class of circle graphs. Many properties of p-critical graphs and partitionable graphs are given, most with simplified proofs. Very efficient algorithms for finding maximum (weighted) cliques and maximum (weighted) stable sets of the derived circle graph of a circle graph sequence are given. Dissert. Abstr.

N81-31873 Maryland Univ., College Park.
THE DESIGN OF A HIGH-LEVEL COROUTINE IMPLEMENTATION FOR THE PRODUCTION OF QUALITY SOFTWARE Ph.D. Thesis
Carl Wrandle Barth 1980 268 p
Avail: Univ. Microfilms Order No. 8116453

The overall activity of a coroutine is viewed as being substantially the same as a normal main program, and the resumption of a coroutine is viewed as being substantially the same as a subroutine call. This view is used to direct the design of an implementation of coroutines in a simple high-level language. The implementation is more self-disciplined, providing a programming tool with greater intellectual manageability. A mathematical basis for the implementation is provided by the use of two formal definitions. The first of these is an implicit definition of the meaning of coroutines using the functional verification techniques of Mills. The second is a constructive definition of an interpreter for the language using the Hierarchical Graph Language modeling technique of Basili. Both full coroutines and semicoroutines are investigated using these methods.
Dissert. Abstr.

N81-31874 Ohio State Univ., Columbus.
COMMUNICATING DISTRIBUTED PROCESSES: A PROGRAMMING LANGUAGE CONCEPT FOR DISTRIBUTED SYSTEMS Ph.D. Thesis
Chung-Ming Li 1981 265 p
Avail: Univ. Microfilms Order No. 8115131

A distributed programming language/system called DISLANG, for use in distributed computing systems and computer networks, is described. A language concept, called Communication Distributed Process (CDP), is proposed to provide language constructs for handling the characteristics of distributed systems. CDP introduces a new language concept called communication/distribution abstraction. All necessary information for process communication, data distribution, and execution parallelism is collected together as a separate component of CDP, called Communicator. Features of process communication, data distribution, and execution parallelism are specified abstractly by using this information, so as to achieve a high level of modularity and a high degree of abstraction. The design of Communication Distributed Processes provides a language concept which encapsulates the characteristics of distributed systems, such as distribution of resources, distribution of control, communication delay, and communication failure. In addition, it is consistent with the current trends in programming language design, such as modularity, abstraction, etc. Dissert. Abstr.

N81-31875 Carnegie-Mellon Univ., Pittsburgh, Pa.
SCRIBE: A DOCUMENT SPECIFICATION LANGUAGE AND ITS COMPILER Ph.D. Thesis
Brian Keith Reid 1981 173 p
Avail: Univ. Microfilms Order No. 8114634

The design and implementation of a computer system for the production of documents, in which the separation of form and content is achieved, is described. A writer prepares manuscript text that contains no mention of specific format; this manuscript text, represented in a document specification language, is processed by a compiler into a finished document. The compiler draws on a database of format specifications that have been prepared by a graphic designer, producing a document that contains the author's text in the designer's format. To simplify the knowledge representation task in the document design database, the document preparation task was parameterized into approximately one hundred independent variables, and the formating compiler is controlled by changing the values of those variables. The content of the document design database is primarily tables of variable names and the values to be assigned to them. To enable substantial feedback from actual users, the resulting computer system was built as a production-quality program. Dissert. Abstr.

N81-31876 Maryland Univ., College Park.
WORD EXPERT PARSING: A THEORY OF DISTRIBUTED WORD-BASED NATURAL LANGUAGE UNDERSTANDING Ph.D. Thesis
Steven Lawrence Small 1980 279 p
Avail: Univ. Microfilms Order No. 8117379

The processes of natural language comprehension and its computational realization are investigated and several claims are made. A formal theory is developed and a computer model constructed to provide evidence to support those claims. Word Expert Parsing explains the understanding of sentences containing highly ambiguous words and complex structures. The distributed word-based approach is advanced as a framework for a full-scale theory of discourse comprehension. The computational theory of Word Expert Parsing approaches natural language understanding as a non-uniform distributed process of interacting words. An expert process for each word actively pursues its intended meaning in the context of other word experts and real-world knowledge. The theory perceives understanding as a behavior of memory interactions, and the computer model emphasizes process rather than output structures. Dissert. Abstr.

N81-31877 Michigan Univ., Ann Arbor.
AN APPROACH TO THE GENERATION OF SOFTWARE LIFE CYCLE SUPPORT SYSTEMS Ph.D. Thesis
Yuzo Yamamoto 1981 313 p
Avail: Univ. Microfilms Order No. 8116361

A class of computer-based systems, called life-cycle support systems (LSS's), that support the application in the systems department, is identified. The functions that an LSS must possess are: (1) accept system description in some predefined notation; (2) maintain a data base containing the system description; (3) perform analyses on the system description stored in the data base; (4) produce documentation and other outputs based on the system description, and (5) perform monitoring and other control functions of development activities. A specialized tool, the LSS generator is proposed. The LSS generator approach consists of two steps: (1) an LSS developer uses the LSS generator to define an LSS in a formal language; (2) the definition of an LSS is processed to generate the LSS software and documentation. In order to do this, the LSS generator must have a model (meta-model) of information processing system models and a language definition facility. Dissert. Abstr.

N81-31878 Michigan Univ., Ann Arbor.
CURSIVE SCRIPT WORD RECOGNITION Ph.D. Thesis
Michael Kenneth Brown 1981 177 p
Avail: Univ. Microfilms Order No. 8116205

Techniques and features developed for machine recognition of cursive script are described. Cursive script is input to a computer using a Rand type graphics tablet. The cursive script pattern is stored as a chronological sequence of X and Y coordinates. New preprocessing techniques eliminate input noise and employ feature extraction utilizing special features to perform prerecognition, a phase in which certain characteristics are recognized before the actual recognition phase is entered in order to aid in script orientation and normalization. Preprocessing operations performance include rotation, vertical and horizontal scaling and deskweing along with some gap filling and spot noise elimination. These operatons are performed in a closed-loop manner in which verification is performed after each operation. From individual handwriting styles it is possible to recognize the script recognize handwriting by providing individual dictionaries for each author. Dissert. Abstr.

N81-31879 Stanford Univ., Calif.
INTEGRATING LOCAL INFORMATION TO UNDERSTAND DIALOG Ph.D. Thesis
Paul Alan Martin 1981 133 p
Avail: Univ. Microfilms Order No. 8115811

A general theory for the recognition, representation, and utilization of coherence and focus in dialog is sketched, and a computer system based on this theory is developed and examined. A resource limited processing scheme is used to compute a plausible graph of related goals for each of the conversants, based on localized analysis of their conversational actions. These conversational actions are the speech acts that occur during a bargaining session between two players of the board game called Diplomacy. The system models the performance of a human observer reading a transcript of a dialog. It understands the dialog in the sense that it abstracts and derives information that corresponds to the knowledge used by the human reader to answer questions what is going on and what the purpose of an utterance might be. The understanding system consists of a resource control framework, an arbitrary number of active recognition processes, and a knowledge base containing information about the relationship of a person's behavior to his underlying goals. Dissert. Abstr.

N81-31880 Maryland Univ., College Park.
A KNOWLEDGE-BASED DESIGN ENVIRONMENT FOR DIGITAL ELECTRONICS Ph.D. Thesis
Milton Robert Grinberg 1980 209 p
Avail: Univ. Microfilms Order No. 8116486

An experimental interactive knowledge-based system whose domain expertise is digital electronics is investigated. The system is named SADD for Semi-Automatic Digital Designer. The goals are (1) to represent the working knowledge that humans have of digital electronics and (2) to utilize this knowledge in a useful design environment. This requires both a digital problem solver and an intelligent bookkeeping mechanism. In the SADD environment, design is a four phase process: specification acquisition, implementation, integration and analysis. In each phase the user can play an integral role in the design. The SADD system uses a sophisticated TV display circuit known as the screensplitter for its case study. The circuit is described in

41 sentences. Since SADD is designed as an intelligent bookkeeping system this description is intentionally incomplete to illustrate how SADD will detect and fill in missing concepts and connections that are necessary for a function to perform properly. Examples using the Screensplitter illustrate each of SADD's phases. Dissert. Abstr.

N81-31881*# Vought Corp., Hampton, Va.
MAIL LOG: PROGRAM OPERATING INSTRUCTIONS
Danny K. Harris May 1979 146 p refs
(Contract NAS1-13500)
(NASA-CR-159065) Avail: NTIS HC A07/MF A01 CSCL 09B

The operating instructions for the software package, MAIL LOG, developed for the Scout Project Automatic Data System, SPADS, are provided. The program is written in FORTRAN for the PRIME 300 computer system. The MAIL LOG program has the following four modes of operation: (1) INPUT - putting new records into the data base (2) REVISE - changing or modifying existing records in the data base (3) SEARCH - finding special records existing in the data base (4) ARCHIVE - store or put away existing records in the data base. The output includes special printouts of records in the data base and results from the INPUT and SEARCH modes. The MAIL LOG data base consists of three main subfiles: Incoming and outgoing mail correspondence; Design Information Releases and Releases and Reports; and Drawings and Engineering orders. Author

N81-31882*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
USER'S GUIDE FOR CCT2WA (CONVERTING CCT'S TO WORK-ADDRESSABLE FILE)
S. D. Williams and D. B. Hackler May 1981 33 p
(Contract NAS9-15800)
(NASA-CR-161076; JSC-17377) Avail: NTIS HC A03/MF A01 CSCL 09B

The CCT2WA program, developed to convert the shuttle post-flight computer compatible tape data to a word addressable mass storage file, is described. The use of utility processors that can be used to copy word addressable files from mass storage to mass storage is also described M.G.

N81-31883# General Research Corp., Santa Barbara, Calif.
FAVS ENHANCEMENTS Final Technical Report, May 1979 - Jun. 1980
R. A. Melton Griffiss AFB, N.Y. RADC May 1981 66 p
(Contract F30602-79-C-0015; AF Proj. 4305)
(AD-A102218; RADC-TR-81-94) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report documents the results of an effort to upgrade the FORTRAN Automated Verification System (FAVS) installations at the Defense Mapping Agency (DMA) Aerospace Center (DMAAC) and Hydrographic/Topographic Center (DMAHTC). The upgrade, which was accomplished by a series of four software releases, included efficiency enhancements, user interface improvements, and the capability to process the ASCII FORTRAN programming language. Author (GRA)

N81-31884# Mitre Corp., McLean, Va.
CANDIDATE R&D THRUSTS FOR THE SOFTWARE TECHNOLOGY INITIATIVE Final Report
Samuel T. Redwine, Jr., Eric D. Siegel, and Gilbert R. Berglass May 1981 216 p refs
(Contract F19628-81-C-0001; AF Proj. 8920)
(AD-A102180; MTR-81W00160) Avail: NTIS HC A10/MF A01 CSCL 05/1

This document is the first iteration towards a technical plan for the DoD Software Technology Initiative, and is intended for review and comment. The background of the Initiative and DoD's historical difficulties with software are covered. Tentative candidates for R D support are discussed in the sequence of their potential for significant incremental payoff -- short-term, (less than 4 years), medium-term (4-7 years), and long-term (more than 7 years). More detailed discussion of the candidates and a list of ideas tentatively rejected are included in appendices. Reviewers should comment using the questionnaire. Author (GRA)

N81-31885# Rochester Univ., N. Y. Dept. of Computer Science.
COMPUTING WITH CONNECTIONS
J. A. Feldman and D. H. Ballard Apr. 1981 60 p refs
(Contracts N00014-78-C-0164; N00014-80-C-0197)
(AD-A102221; TR-72) Avail: NTIS HC A04/MF A01 CSCL 09/2

There is a rapidly growing interest in problem-scale parallelism, both as a model of animal brains and as a paradigm for VLSI. Work at Rochester has concentrated on connectionist models and their application to vision. This paper lays out a framework for dealing with such problems. The framework is built around computational modules, the simplest of which are termed p-units. We develop their properties and show how they can be applied to a variety of problems. To show how the framework can be applied to computational problems in vision, two specific examples are developed in some detail. In the first, we describe how spatially distributed data can be associated with a complex concept. In the second, we discuss the shape from shading problem and show how a global parameter, such as light source position, interacts with the calculation of a spatially distributed parameter such as surface orientation. Author (GRA)

N81-31886# Ohio State Univ., Columbus. Computer and Information Science Research Center.
AN APPROACH TO RELIABLE INTEGRATION TESTING
Allen Haley and Stuart Zweben May 1981 43 p refs
(Contract F49520-79-C-0152; Grant NSF MCS-80-18769; AF Proj. 2304)
(AD-A102477; OSU-CISRC-TR-81-5; AFOSR-81-0578TR)
Avail: NTIS HC A03/MF A01 CSCL 09/2

A testing strategy which involves integrating a previously validated module into a software system is described. It is shown that, when doing the integration testing, it is not enough to treat the previously validated module as a 'black box', for otherwise certain integration errors may go undetected. For example, an error in the calling program may cause an error in the module's input which will only result in an error in the module's output along certain paths through the module. The results indicate that such errors can be detected by the module by retesting a set of paths whose cardinality depends only on the dimensionality of the module's input space, rather than on the module's path complexity. Author (GRA)

N81-31887# Comite National Francais de Recherches dans l'Espace, Paris.
GENERALIZED MONITORING FACILITY. USER'S MANUAL
Barry M. Wallack and George H. Gero, Jr. 1 May 1981 492 p refs Supersedes CCTC-CSM-UM-246-80
(AD-A102392; CCTC-CSM-UM-246-81; DCA/DF-81/001A; CCTC-CSM-UM-246-80) Avail: NTIS HC A21/MF A01 CSCL 09/2

This user's manual provides the information necessary for an individual to run all of the programs that are comprised in the Generalized Monitoring Facility (GMF). Program interrelationships are presented, as well as a general overview of the processing, input and output procedures for each program. Formats and examples of user-controlled input data and sample program outputs are shown and explained. Additionally, the Job Control Language (JCL) deck setups necessary to run the programs are provided. Author (GRA)

N81-31888# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
ABSTRATION, INSPECTION AND DEBUGGING IN PROGRAMMING
Charles Rich and Richard C. Waters Jun. 1981 33 p refs
(Contract N00014-80-C-0505; NSF MCF-79-12179)
(AD-A102157; AI-M-634) Avail: NTIS HC A03/MF A01 CSCL 09/2

We believe that software engineering has much to learn from other mature engineering disciplines, such as electrical engineering, and that the problem solving behaviors of engineers in different disciplines have many similarities. Three key ideas in current artificial intelligence theories of engineering problem solving are: Abstraction -- using a simplified view of the problem to guide the problem solving process. Inspection -- problem solving

by recognizing the form ('plan') of a solution. Debugging -- incremental modification of an almost satisfactory solution to a more satisfactory one. These three techniques are typically used together in a paradigm which we call AID (for Abstraction, Inspection, Debugging): First an abstract model of the problem is constructed in which some important details are intentionally omitted. In this simplified view inspection methods are more likely to succeed, yielding the initial form of a solution. Further details of the problem are then added one at a time with corresponding incremental modifications to the solution. This paper states the goals and milestones of the remaining three years of a five year research project to study the fundamental principles underlying the design and construction of large software systems and to demonstrate the feasibility of a computer aided design tool for this purpose, called the programmers apprentice.
Author (GRA)

N81-31889# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
SNIFFER: A SYSTEM THAT UNDERSTANDS BUGS
Daniel G. Shapiro Jun. 1981 59 p refs
(Contracts N00014-80-C-0505; N00014-75-C-0642; Grant NSF MCS-79-12179)
(AD-A102158; AI-M-638) Avail: NTIS HC A04/MF A01 CSCL 09/2

This paper presents a bug understanding system, called SNIFFER, which applies inspection methods to generate a deep understanding of a narrow class of errors. SNIFFER is an interactive debugging aide. It can locate and identify error-containing implementations of typical programming cliches, and it can describe them using the terminology employed by expert programmers. Author (GRA)

N81-31890# Maryland Univ., College Park. Dept. of Computer Science.
ANALYZING A SYNTACTIC FAMILY OF COMPLEXITY METRICS
Victor R. Basili and David H. Hutchens May 1981 33 p refs
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A101920; TR-1053; AFOSR-81-0579TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

A family of syntactic complexity metrics which contains a number of current metrics is defined. The family is used as a basis for experimental analysis of metrics. Once the family has been implemented, several metrics may be readily formed and computed. This paper uses the family to compare a few simple syntactic metrics to each other. The study also indicates that individual differences have a large impact on the significance of results where many individuals are used. A metric for determining the relative skills of programmers at handling a given level of complexity is also suggested. The study uses the metrics to demonstrate differences between projects on which a methodology was used vs. those on which it was not. Author (GRA)

N81-31891# University of Southern California, Marina del Rey. Information Sciences Inst.
TRANSFORMATIONAL IMPLEMENTATION: AN EXAMPLE
Robert Balzer May 1981 60 p refs
(Grant NSF MCS-76-8390)
(AD-A101994; ISI/RR-79-79) Avail: NTIS HC A04/MF A01 CSCL 09/2

Program Manipulation Systems have been proposed as an alternative programming paradigm in which the PROCESSES of design and implementation are themselves the subject of study. These processes are captured and recorded to provide documentation of the program, the basis for its validation, and the framework within which future maintenance will occur. This extension of the conventional programming paradigm to include the development of the program as a computer processable object in addition to the program itself is quite profound. A key insight of the Program Manipulation approach is that transformations provide a sufficient basis for the design and implementation processes. Each development decision can be represented as a transformation applied to the program. Thus, a development if merely a linear sequence of transformations applied to the PROGRAM resulting from the previous stage of development. Each stage of the development corresponds to the transformation of a program treated as a specification into another treated as an implementation. Thus, development is an iterative (or sometimes a recursive) process of successive refinement in which a specification is gradually transformed into an implementation. This implies that the original specification of the program is itself a program (so that it can be transformed). To be a program, the specification language must have a formal semantics (thus precluding pseudo-code type languages) so that validity of transformations and of the development process is a meaningful concept.
Author (GRA)

N81-31892# University of Southern California, Marina del Rey. Information Sciences Inst.
DESIGN SPECIFICATION VALIDATION Final Technical Report, 29 Sep. 1979 - 29 Dec. 1980
Robert M. Blazer Griffiss AFB, N.Y. RADC Jun. 1981 170 p refs
(Contract F30602-79-C-0042; AF Proj. 5581)
(AD-A102361; RADC-TR-81-102) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report documents research concerning the feasibility of validating formal software specification. The one year effort attempted to show that with a suitable formal software specification language, specifications could be validated in the same manner as computer designs are currently tested. GRA

N81-31893# University of Southern California, Los Angeles. Image Processing Inst.
IMAGE UNDERSTANDING RESEARCH Semiannual Technical Report, 1 Oct. 1980 - 31 Mar. 1981
Ramakant Nevatia and Alexander Sawchuk 31 Mar. 1981 107 p refs
(Contract F33615-80-C-1080; DARPA Order 3119)
(AD-A102471; USCIPI-1010) Avail: NTIS HC A06/MF A01 CSCL 09/2

The purpose of this research program is to develop techniques and systems for understanding images, particularly for mapping applications. The research activity includes low level image analysis and feature extraction, statistical and structural texture analysis, symbolic image representations, and image to map correspondence using relational structures. Additional activity is concerned with VLSI architectures for implementation of image analysis and image understanding operations. GRA

N81-31894# Los Alamos Scientific Lab., N. Mex.
EVENT-ANALYSIS LANGUAGE FOR HIGH-SPEED DATA ACQUISITION
R. A. Hardekopf, R. V. Poore, J. W. Sunier, M. Neiman, and A. Holm 1981 6 p refs Presented at the Topical Conf. on Computerized Data Acquisition in Particle and Nucl. Phys., Oak Ridge, Tenn., 28 May 1981 Prepared in cooperation with Calif. Univ., Berkeley, Lawrence Berkeley Lab. and Niels Bohr Inst., Copenhagen, Denmark
(Contract W-7405-eng-36)
(LA-UR-81-1550; CONF-810523-2) Avail: NTIS HC A02/MF A01

A multiparameter data acquisition program that is highly flexible and yet provides optimum machine code for each individual set of sorting is described. An Event Analysis Language (EVAL) compiler allows full control over the handling of events and produces code which runs four to six times faster than a generalized program. This technique was integrated into the data acquisition system for high speed sorting of a wide variety of input data from CAMAC or magnetic tape. The EVAL complier is written in FORTRAN for MODCOMP computers but can be easily modified for other systems. DOE

N81-31895# California Univ., Livermore. Lawrence Livermore Lab.
FACILITY MANAGEMENT OF COMPUTER-AIDED DESIGN, DRAFTING/MANUFACTURING SYSTEMS (CADD/M)
Frederick J. Norton 23 Sep. 1980 50 p Presented at the 6th Ann. ADUA Meeting, Denver, 30 Sep. - 3 Oct. 1980 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-84959; CONF-8009151-1) Avail: NTIS HC A03/MF A01

Interactive computer aided design drafting manufacturing

system are described. A gap exists between the capabilities of CADD/M systems and the actual usage by industry of those capabilities. The responsibilities of the interactive graphics facility management team are explained in detail. It is concluded that proper management of a CADD/M facility is more critical to the success or failure of the facility than any other factor. DOE

N81-31896# General Atomic Co., San Diego, Calif.
SIMPLIFIED PLOTTING PACKAGE FOR THE LSI-11 COMPUTER AND TEKTRONIX TERMINALS
P. Henline Dec. 1980 25 p refs
(Contract DE-AT03-76ET-51011)
(GA-A-16148) Avail: NTIS HC A02/MF A01

These plotting subroutines were written to allow the user to do plotting easily and quickly, but do not contain many fancy features in order to minimize memory space. Plots are produced of real values only. The first element of the plotting array contains the number of points to plot and the values to plot are stored in the remaining array locations. The maximum number of points which can be plotted is 300. The user must provide titles and other alpha numeric information. This can be done easily by a call to LOCATE, then ALPHA, and then doing a FORTRAN write. LOCATE and ALPHA are part of the Oak Ridge TEK11 Graphics Package. All plots are framed and labeled. The X axis has ten tick marks and three labels (left, center, and right side) and the Y axis has three tick marks and three labels. The subroutines assume the user is smart. Curves (especially when more than one is drawn on one plot) are assumed to be completely within the defined area as no clipping or dark lines are drawn. The user has the ability to do multiple curves on one graph or multiple graphs on a page. DOE

N81-31897# Sandia Labs., Albuquerque, N. Mex. Computer-Aided Design Div.
CODE TRANSLATION PROGRAM FOR HEWLETT-PACKARD COMPUTERS
Thomas B. Linnerooth May 1981 23 p
(Contract DE-AC04-76DP-00789)
(SAND-81-0627) Avail: NTIS HC A02/MF A01

A computer program which was designed to copy to and from magnetic tapes with code conversion is described. The program is compatible with Hewlett-Packard's RTE-IVB operating system. DOE

N81-31898# Scientific Simulation Corp., Albuquerque, N. Mex.
PROGRAMMERS MANUAL FOR IOSYM: AN INPUT-ORIENTED SIMULATION LANGUAGE FOR CONTINUOUS SYSTEMS, VOLUME 1
Daniel Michael Smith Jun. 1981 137 p 2 Vol.
(Contract DE-AC04-76DP-00789)
(SAND-80-7154/1-Vol-1) Avail: NTIS HC A07/MF A01

An extension of the GASP IV simulation languager (IOSYM) is described. Systems which are sequences of continuous processes are modeled graphically. Normally the system can be described by data input only. The language permits stochastic sequencing and termination criteria for processes and allows crossing conditions for ending operations that are more general than GASP IV. Extensive capability exists for conditional branching and logical modification of the network. The program was used to model the cost of geothermal drilling where the various costly processes of drilling are represented by IOSYM operations. The language is much more general, however, since it retains more of GASP IV's discrete event capabilities and permits easy modeling of continous processes. DOE

N81-31899# Scientific Simulation Corp., Albuquerque, N. Mex.
PROGRAMMERS MANUAL FOR IOSYM: AN INPUT-ORIENTED SIMULATION LANGUAGE FOR CONTINUOUS SYSTEMS. VOLUME 2: SUBPROGRAM DESCRIPTION
Daniel Michael Smith Jun. 1981 504 p 2 Vol.
(Contract DE-AC04-76DP-00789)
(SAND-80-7154/2-Vol-2) Avail: NTIS HC A22/MF A01

An extension of the GASP IV simulation language is presented. It permits systems which are sequences of continuous processes to be modeled graphically. Normally the system can be described by data input only. The language permits stochastic sequencing and termination criteria for processes and allows crossing conditions for ending operations that are more general than GASP IV. Extensive capability exists for conditional branching and logical modification of the network. The IOSYM is used to model the cost of geothermal drilling where the various costly processes of drilling are represented by IOSYM operations. The language is much more general however; it retains more of GASP IV's discrete event capabilities and permits easy modeling of continuous processes. DOE

N81-31900# Research Inst. of National Defence. Stockholm (Sweden).
A SMALL OPERATING SYSTEM FOR REAL-TIME RUNS ON A NORD-10 [EN LITEN OPERATIVSYSTEMKAERNA FOER REALTIDSKOERNINGAR I NORD-10]
Svante Jahnberg Feb. 1980 21 p In SWEDISH
(FOA-C-20336-E3) Avail: NTIS HC A02/MF A01

A NORD-10 data system is used for the calculation of guidance signals in a feedback automatic control system. In order to execute this task a simple system core with limited memory was developed. Both a foreground process as well as a background process is used both processes are written in FORTRAN. A program listing is given. J.M.S.

N81-31901# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ABSTRACT STORAGE STRUCTURES
H. B. M. Jonkers Jan. 1981 34 p refs Submitted for publication
(MC-IW-158/81) Copyright. Avail: NTIS HC A03/MF A01

A model for the description of data storage structures is presented. It is based on the consideration that a storage structure is completely characterized by two things: the collection of its access paths and a relation which indicates whether two access paths access the same substructure. The model, called a structure, is abstract in the sense that it is free of low level concepts such as pointers and garbage, while at the same time it is general in that is allows the description of storage structures with arbitrary sharing and circularities. Operations on structures (such as creation and replacement) can be described very naturally in terms of three primitive operations. These primitive operations are defined using a special partial order, which turns the set of all structures into a complete lattice. Author (ESA)

N81-31902# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
ISSUES IN THE DESIGN OF A BEGINNERS' PROGRAMMING LANGUAGE
Lambert G. L. T. Meertens Feb. 1981 22 p refs Submitted for publication
(MC-IW-161/81) Copyright. Avail: NTIS HC A02/MF A01

An algorithmic computer language called 'B' is discussed. The design objectives for B are simplicity, suitability for conversational use and inclusion of structured programming tools. A systematic approach to selecting the system characteristics is described. For each combination of microscopic design decisions a check list of potential unacceptable or undesirable consequences is inspected. The selection is computer assisted. The language B is described as the limit of a sequence B0, B1, ...
Author (ESA)

N81-31903# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
FROM VAN WIJNGAARDEN-GRAMMAR TO ALEPH
Dick Grune Mar. 1981 19 p refs Submitted for publication
(MC-IW-162/81) Avail: NTIS HC A02/MF A01

The Aleph programming language is described. Aleph is an acronym for a language encouraging program hierarchy. Aleph is derived from an analysis of grammars rather than from that of programming languages. The notion of two-color Van Wijngaarden (VW) grammars is developed. The definition of affix grammars is recalled and the relationship with VW grammars is discussed. The flow-of-control rules that characterize the Aleph language and a central theorem useful in deriving assertions are presented. The analogy between grammars and programs and between parsing and problem solving is shown to be useful for designing a practical language that has some properties not usually found in programming languages. Author (ESA)

N81-31904# Royal Signals and Radar Establishment, Malvern (England).
PSEUDO: A MACRO BASED HIGH LEVEL LANGUAGE FOR THE PDP-11
B. Davy 1978 66 p refs
(RSRE-MEMO-2875; BR64523) Avail: NTIS HC A04/MF A01

The PSEUDO language was developed for the PDP-11 disk operating system for a real-time control application. High level source text statements are interpreted as macrocalls which are expanded by the standard DOS MACRO-11 assembler. PSEUDO allows uninhibited use of word or byte operations, unlimited use of all PDP-11 addressing modes, user control of register assignment and usage, including stack operations. PSEUDO incorporates the syntax of the MACRO-11 assembly language; i.e., any legal MACRO-11 statement is a legal PSEUDO statement. The relevant syntax rules refer to expressions and register expressions. Examples of macro generation, source text, a normal and an expanded assembly listing and PSEUDO macro definitions are provided. The time and effort required to write and debug programs written in PSEUDO is insignifiant in relation to overall system software development. Author (ESA)

62 COMPUTER SYSTEMS

Includes computer networks.

No abstracts in this category.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

N81-31905# Brown Univ., Providence, R. I. Center for Dynamical Studies.
ALMOST SURE CONVERGENCE OF ADAPTIVE IDENTIFICATION PREDICTION AND CONTROL ALGORITHMS
Rajendra Kumar Mar. 1981 38 p refs
(Grants AF-AFOSR-3063-76; NSF ENG-77-12946)
(AD-A102041; LCDS-81-8; AFOSR-81-0577TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with the almost sure convergence of the adaptive parameter estimation, N-step ahead prediction and control algorithms based upon standard least square algorithm. With the usual stability and passivity assumptions for the prediction problem, it is demonstrated that the state estimation and the N-step ahead prediction errors converge to the optimum such errors achievable with known plant parameters, in the Cesaro sense. An additional regularity assumption on the signal model establishes the result that the state estimation and prediction errors also converge in the strong sense at an asymptotically arithmetic rate. Under an additional persistency of excitation condition it is shown that the parameter estimation error converges to zero at a rate specified by the degree of excitation. The persistency of excitation condition being of a trivial nature is also necessary condition for parameter convergence. With the regularity condition holding, the convergence is also established for the adaptive control algorithms, e.g. self tuning regulators under the usual minimum phase restriction on the plant. In this case, the tracking error equals the N-step ahead prediction error and thus converges to its optimum value at an asymptotically arithmetic rate. Author (GRA)

N81-31906# California Univ., Berkeley. Operations Research Center.
MULTI-SERVER QUEUES
Sheldon M. Ross Jun. 1981 16 p refs
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A101851; ORC-81-17) Avail: NTIS HC A02/MF A01 CSCL 12/1

We will survey a variety of multiserver models in which the arrival stream is a Poisson process. In particular, we will consider the Erlang loss model in which arrivals finding all servers busy are lost. In this system, we assume a general service distribution. We will also consider finite and infinite capacity versions of this model. Another model of this type is the shared processor system in which service is shared by all customers. Another model to be considered is the G/M/K in which arrivals are in accordance with a renewal process and the service distribution is exponential. We will analyze this model by means of the embedded Markov chain approach. Author (GRA)

N81-31907# Maryland Univ., College Park. Computer Vision Lab.
CELLULAR ARCHITECTURES: FROM AUTOMATA TO HARDWARE
Azriel Rosenfeld May 1981 16 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A102059; TR-1048; AFOSR-81-0557TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Cellular automata have been studied for many years both as pattern generators and as acceptors for pattern languages. At the same time, computer architectures analogous to two-dimensional cellular automata have been proposed and used for image processing and recognition. In recent years, various extensions to the basic cellular automation concept have been proposed. These extensions should be of interest in connection with the design of future hardware system for image processing and analysis. Author (GRA)

N81-31908# Maryland Univ., College Park. Computer Vision Lab.
EDGE-BASED TEXTURE MEASURES
Matti Pietikanenen (Oulu Univ.) May 1981 30 p refs
(Grant AF-AFOSR-3271-77)
(AD-A102060; TR-1050; AFOSR-81-0548TR) Avail: NTIS HC A03/MF A01 CSCL 05/8

A class of texture measures is introduced based on first-order statistics derived from edges in the image. These measurement are related to the generalized cooccurrence features of Davis et al. They yield good discrimination among textures on perceptually plausible grounds. Author (GRA)

N81-31909# Scientific Systems, Inc., Cambridge, Mass.
BASIC RESEARCH IN DIGITAL STOCHASTIC MODEL ALGORITHMIC CONTROL Final Report, May 1979 - Sep. 1980
Ramon K. Mehra, John. S. Eterno, Ramine Rouhani, Robert B. Washburn, Jr., David B. Stillman, and L. Praly Nov. 1980 278 p refs
(Contract F33615-79-C-631; AF Proj. 2304)
(AD-A102145; AFWAL-TR-80-3125) Avail: NTIS HC A13/MF A01 CSCL 12/1

This report presents the results of basic research in Model Algorithmic Control (MAC) with application to flight control systems. MAC is a new digital control design approach which relies on the following features: (1) an internal model of the system to be controlled; (2) a reference trajectory description of desired closed loop behavior; and (3) an on-line optimization of future control inputs to produce the desired performance. MAC is well suited to the new generation of microprocessors, and is applicable to a wide variety of aerospace problems. The purpose of this report is to explore the theoretical foundations and robustness of MAC and to examine its application to flight control problems. A missile attitude control simulation is chosen as a typical control design problem and used to demonstrate the application of MAC theory. The major conclusion of this report is that MAC is a very flexible, powerful and promising technique for linear multivariable control design. Its theoretical properties of optimality, convergence, robustness and stability are verified by simulations of the missile attitude control example. It is recommended that future studies of MAC concentrate on its extensions to the adaptive case and on flight test demonstration of MAC concepts. Author (GRA)

N81-31910# Sheffield Univ. (England). Dept. of Control Engineering.
CASE STUDIES IN COMPUTER CONTROL

J. B. Edwards Mar. 1981 78 p refs
(RR-145) Avail: NTIS HC A05/MF A01

The computer control of three different processes is investigated. These processes are longwall coal cutting, electric vehicle testing, and a pilot distillation column. Analytical process modelling, control theory and computer control strategies are investigated from the systems engineering viewpoint. Test procedures, safety aspects and specifications for hardware and software components are discussed. The benefits to be derived are considerably greater than in ordinary applications of computer control. It is also claimed that those processes cannot operate efficiently without computer control. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N81-31911*# Houston Univ., Tex. Dept. of Electrical Engineerng.
RESEARCH ON NUMERICAL ALGORITHMS FOR LARGE SPACE STRUCTURES Final Report, 15 Mar. 1980 - 14 Mar. 1981
Eugene D. Denman 14 Mar. 1981 95 p refs
(Grant NsG-1603)
(NASA-CR-164721) Avail: NTIS HC A05/MF A01 CSCL 12A

Numerical algorithms for analysis and design of large space structures are investigated. The sign algorithm and its application to decoupling of differential equations are presented. The generalized sign algorithm is given and its application to several problems discussed. The Laplace transforms of matrix functions and the diagonalization procedure for a finite element equation are discussed. The diagonalization of matrix polynomials is considered. The quadrature method and Laplace transforms is discussed and the identification of linear systems by the quadrature method investigated. J.D.H.

N81-31912# Gould, Inc., Glen Burnie, Md.
TABLE OF THE MODIFIED BESSEL FUNCTIONS OF ORDERS ZERO AND ONE TOGETHER WITH THE FUNCTION PHI(Z)=(21SUB1)(Z)/(ZLSUB0)(Z) AND ITS RECIPROCAL FOR COMPLEX ARGUMENT
O. Lindemann 5 Jun. 1981 231 p
(Contract N00014-78-C-0572)
(AD-A102444; Rept-78243-630-004) Avail: NTIS HC A11/MF A01 CSCL 12/1

These tables are intended as an aid in the calculation of axisymmetric wave motion in cylindrical structures using elastic, viscoelastic and viscous materials. They have been calculated by straighforward summing of the power and asymptotic series. The programs can be used to print more extensive tables, should the demand exist. GRA

N81-31913# Rochester Univ., N. Y. Dept. of Computer Science.
EXPERIENCE WITH GENERALIZED HOUGH TRANSFORM
K. R. Sloan, Jr. and D. H. Ballard Oct. 1980 13 p refs
(Contract N00014-78-C-0164)
(AD-A102222; TR-83) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Hough Transform is a method for detecting curves by exploiting the duality between points on a curve and parameters of that curve. The initial work showed how to detect both analytic curves (Hough, 1962; Duda and Hart, 1972) and non-analytic curves (Merlin and Farber, 1975), in the case of binary edge images. This work was generalized to the detection of some analytic curves in grey level images, specifically lines (O:Gorman and Clowes, 1973), circles (Kimme et al., 1975), and parabolas (Wechsler and Sklansky, 1977). Recently, the Hough technique has been extended to the detection of arbitrary non-analytic shapes in grey level images (Ballard), 1979). This shape detection scheme has been implemented and tested on a variety of artificial images and has found application in the analysis of real aerial images. Experience to date indicates that the technique is robust with respect to occlusions, but requires reliable edge-element orientation determination. Author (GRA)

N81-31914# Stanford Univ., Calif. Dept. of Statistics.
LONG UNIMODAL SUBSEQUENCES: A PROBLEM OF F. R. K. CHUNG
J. Michael Steele 2 Apr. 1981 7 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A102168; TR-301) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let l(n) be the expected length of the longest unimodal subsequence of a random permutation. It is proved here that l(n)/square root of n converges to 2 square root of 2. This settles a conjecture of F.R.K. Chung. Author

N81-31915# Los Alamos Scientific Lab., N. Mex. Code Development Group.
SECOND-ORDER PARTICLE-IN-CELL (PIC) COMPUTATIONAL METHOD IN THE ONE-DIMENSIONAL VARIABLE EULERIAN MESH SYSTEM
J. J. Pyun 1981 12 p refs Presented at the Intern. Conf. on Numerical Methods for Laminar and Turbulent Flow, Venice, Italy, 13 Jul. 1981
(Contract W-7405-eng-36)
(LA-UR-81-318; CONF-810702-4) Avail: NTIS HC A02/MF A01

As part of an effort to incorporate the variable Eulerian mesh into the second order particle-in-cell (PIC) computational method, a truncation error analysis was performed to calculate the second order error terms. Limits of the maximum mesh size increment/decrement are determined. The numerical solutions of Burgers' equation by the second-order PIC method in the variable Eulerian mesh system were compared with its exact solution. It was found that the second order accuracy in the PIC method was maintained under the condition given. Additional problems were analyzed using the second order PIC methods in both variable and uniform Eulerian mesh systems, indicating that the PIC method can provide substantial computational time saving with no loss in accuracy. DOE

N81-31916# Harding Coll., Searcy, Ark. Dept. of Mathematics.
K-LINE ITERATIVE METHODS: A CONJUGATE-GRADIENT APPROACH
David Kratzer, Seymour V. Parter (Wisconsin Univ., Madison), and Michael Steurwalt (LASL, N. Mex.) 29 Mar. 1981 8 p refs Presented at the IMACS Symp. on Computer Methods for PDE's, Bethlehem, Pa., 30 Jun. - 2 Jul. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1409; CONF-810628-2) Avail: NTIS HC A02/MF A01

The generalized conjugate gradient scheme based on the k-line block Jacobi splitting A = M-N was studied for solving model two dimensional parabolic and elliptic difference equations AU = F tilde. A represents the matrix ch(alpha)-h(2)delta sub h. Eigenvalues of M(-1)N cluster, and the cluster radii decrease as ch(alpha) or k increases. Computations with k = 4, 8, 16, 32, and ch(alpha) = o, h, 2 are discussed. DOE

N81-31917# Research Inst. of National Defence, Stockholm (Sweden).
A REGRESSION ANALYSIS MODEL WITH SOME TRANSFORMATIONS OF THE VARIABLES INVOLVED [EN REGRESSIONSANALYSMODELL SAMT NAEGRA TRANSFORMATIONER PAA INGAAENDE BARIABLER]
Goeran Sten Jan. 1980 250 p In SWEDISH
(FOA-C-20332-D8) Avail: NTIS HC A11/MF A01

A method of testing multiple liner regression analysis problems, based on the view that they are composed of a number of single regression models is described. The selection of the final model is based on the stepwise principle. The model is programmed in PL/1 on an IBM 370 with outputs, inter alia, for a number of ranked entities as well as plotting residuals as aids for statistical analysis, model control, etc. Some other categories of transformation are tied to the model in order to study more thoroughly possible multiple linear relationships, distribution assumption, and certain types of nonlinear regression models. Experience gained from armor and air targeting problems

through the application of this program is addressed. Further complementary models and programs are planned for special impact problems and field study. J.M.S.

N81-31918# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
COMPACT DEFERRED CORRECTION FORMULAS
Bengt Lindberg 1980 15 p refs
(TRITA-NA-8007) Avail: NTIS HC A02/MF A01

Deferred correction formulas are presented and applied to two point boundary value problems for ordinary differential equations. The compact formulas can be considered to be generalizations of the Collatz Mehrstellenverfahren obeying certain side conditions to make them suitable for iterative deferred corrections. The ideas presented can also be applied to other types of discretization algorithms, e.g., to discretizations of elliptic boundary value problems in several variables. Author (ESA)

N81-31919# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
ON A GENERALIZED FALKNER-SKAN EQUATION
A. P. Veldman and A. I. vandeVooren (Groningen Rijksuniv., Netherlands) 8 Sep. 1980 13 p refs Submitted for publication
(NLR-MP-80035-U) Avail: NTIS HC A02/MF A01

An existence and uniqueness theorem is presented for the generalized Falkner-Skan equation y''' + muyy'' + lambda (1-y'squared) = 0, with given boundary conditions in the case mu < 0 and lambda > 0. The asymptotic behavior of the solution is discussed showing that the solution exhibits algebraic behavior at infinity. Author (ESA)

N81-31920# Fondazione Ugo Bordoni, Rome (Italy).
REPRESENTATION OF WALSH DISCRETE FUNCTIONS OF THE INPUT-OUTPUT EQUATION FOR PSEUDOLINEAR SYSTEMS [RAPPRESENTAZIONE MEDIANTE FUNZIONI DISCRETE DI WALSH DEL L'EQUAZIONE INGRESSO-USCITA DI SISTEMI PSEUDOLINEARI]
Odoardo Brugia and William Wolfowicz Mar. 1981 5 p refs In ITALIAN
(FUB-3-1981) Avail: NTIS HC A02/MF A01

The possibility of representing the inlet-outlet equation for pseudolinear systems by Walsh discrete functions is demonstrated. A pseudolinear system consisting of unitary delay elements, binary multipliers and a module two summing element is considered. Walsh functions are defined. An operator module sub two is defined and used to formulate the inlet-outlet equation. This equation is then expressed in terms of Walsh discrete functions. The use of Walsh functions in the analysis of the statistical properties of the outlet sequences of pseudolinear binary systems is therefore justified. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N81-31921 Missouri Univ. -Columbia.
ON MULTIPLE COMPARISONS Ph.D. Thesis
Babubhai Girdhardas Patel 1980 78 p refs
Avail: Univ. Microfilms Order No. 8117460

Two approaches to the solution of multiple comparison problems are presented. The first approach is to study the problem of multiple comparisons from the observed significance level point of view. The observed significance level of a significance test is defined to be the smallest size at which the observed data would reject the null hypothesis. Multiple comparison problems are concerned with a null hypothesis and a collection of departures from that null hypothesis. The significance tests, one for each departure, are performed using the same data and their observed significance levels are computed. The departure corresponding to the smallest observed significance level is declared to be the most significant and its observed significance level is adjusted to allow for this selection. Using the concept of signed dependence, an approximate expression is obtained for the adjusted observed significant level. The second approach is to adapt methods explained in Draper and Smith which are commonly used to select the best regression. Dissert. Abstr.

N81-31922 Maryland Univ., College Park.
SHRINKAGE IN PRINCIPAL COMPONENTS WITH APPLICATIONS TO FACTOR ANALYSIS Ph.D. Thesis
Frederic Mark Schemmer 1980 90 p
Avail: Univ. Microfilms Order No. 8117372

The concept of shrinkage, as (1) a statistical phenomenon of estimator bias, and (2) a change in explained variance resulting from cross validation, is defined in the context of principal components based factor analysis. In generalizing this concept from multiple regression to principal components, three specific types of shrinkage emerge. One type is a function of the bias of sample eigenvalues when they are used to estimate their respective population eigenvalues. The second type is related to the change in the variance of linear composites defined by the sample derived eigenvectors when these vectors are cross-validated on a second sample drawn from the same population. A third type of shrinkage similarly arises when the cross-validation is computed on the entire population from which the original sample was drawn. Limited-case analytic equations are derived to describe the three types of shrinkage for the case when only two variables are measured. Hypotheses relating the specific effects of independent variables to the magnitude of shrinkage are presented and tested by means of a Monte Carlo simulation. Dissert. Abstr.

N81-31923 North Carolina Univ. at Chapel Hill.
COVARIANCE OPERATORS AND THEIR APPLICATIONS IN PROBABILITY AND INFORMATION THEORY Ph.D. Thesis
Ian Wray McKeague 1980 106 p
Avail: Univ. Microfilms Order No. 8114841

Representations and characterizations of various types of covariance operators are obtained and applied: (1) to weak convergence of probability measures on Banach spaces; (2) to the coding capacity problem for Gaussian and non-Gaussian communication channels. Characterizations of compact covariance operators on separable Banach spaces are obtained and used to show that Levy's continuity theorem holds only on finite dimensional Banach spaces. Representations and characterizations of joint covariance operators on infinite product spaces are obtained. Cross-covariance operators of strong second-order measures on the product of two separable Banach spaces are characterized by strongly nuclear operators. Representations of cross-covariance operators are used to find the information capacity of channels with Gaussian noise on locally convex spaces. The information capacity is shown to be robust under small deviation of the noise process from normality. The coding capacity of general and time-continuous Gaussian channels is found using results on information capacity. For the case of non-Gaussian noise it is shown that, under a mild entropy condition, the coding capacity does not exceed the coding capacity with Gaussian noise. Dissert. Abstr.

N81-31924 Texas A&M Univ., College Station.
AN EXAMINATION AND COMPARISON OF TWO SAMPLING PROCEDURES FOR ESTIMATING THE RELIABILITY AND AMOUNT OF ERROR IN AN INFORMATION PROCESSING SYSTEM Ph.D. Thesis
Mark Eathan Eakin 1980 144 p
Avail: Univ. Microfilms Order No. 8111395

Several questions on sampling and estimation in information processing systems that are in series with k-steps are addressed. Two sampling schemes, sampling each step and sampling only output, are investigated. Criteria are developed to compare the two sampling plans. Sampling each step requires construction of optimal sample size allocation formulas. Optimal allocation means allocation of the sampling to the processing steps in order to minimize variance of the estimators being used. Sample size formulas use a priori numerical information. Graphs are exhibited to show the effect of incorrect a priori numerical information on the variance of an estimator. Sample size procedures are compared with an existing procedure. Nonclassical estimation is also adapted to the two sampling plans.
Dissert. Abstr.

N81-31925 Oregon State Univ., Corvallis.
PREDICTING UNIT VARIATE VALUES IN A FINITE POPULATION Ph.D. Thesis
Nancy Jean Carter 1981 93 p
Avail: Univ. Microfilms Order No. 8117486

Th problem of predicting variate values for all individual units in a finite population based on a sample of some of the units is investigated. Two prediction problems are considered: the one-stage prediction problem where the unit variate values are directly observable for each sample unit, and the two-stage prediction problem where the sample units are subsampled in order to estimate the variate values for these units. A superpopulation model-based approach is suggested to both of these problems. In both cases, a model framework is developed, predictors given for the unit variate values, and the error variances of these predictors are derived. An important aspect in the sample design of these prediction problems is the allocation of the sample. An algorithm is developed for selecting specific units to be sampled. This selection procedure is used for the one-stage problem to derive a method for determining the number of units to sample to achieve a prespecified precision on the predictors. For the two-stage problem, a method is developed for selecting both the number of units and subunits to achieve a fixed sample size while minimizing the error variances of the predictors.
Dissert. Abstr.

N81-31926 North Carolina Univ., Chapel Hill.
AN ASYMPTOTIC EXPANSION OF THE DISTRIBUTION OF THE WEIGHTED-DIFFERENCE CLASSIFICATION CRITERION FOR DISCRIMINATION OF TWO AND THREE MULTIVARIATE NORMAL POPULATIONS Ph.D. Thesis
David Allen Kikuchi 1980 353 p
Avail: Univ. Microfilms Order No. 8114829

The problem of discriminating between two multivariate normal populations when one population has a dispersion matrix that is a scalar multiple of the dispersion matrix of the other population is considered. The resulting test statistic may be regarded as a kind of weighted difference between the squared distances of the unknown observation and each of the two populations. Some analytic and graphical comparisons of the misclassification probabilities for the weighted difference and the usual linear discrimination statistic for two multivariate normal populations with common dispersion for the case of known population parameters suggest that the latter is uniformly better. The theory is extended to three multivariate normal populations, making extensive use of a new probability distribution.
Dissert. Abstr.

N81-31927# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical and Computer Engineering.
AN ADAPTIVE ARMA SPECTRAL ESTIMATOR, PART 1
James A. Cadzow and Randolph L. Moses Jun. 1981 11 p refs Presented at conf.
(AD-A101869; Rept-9) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, a novel procedure for generating an ARMA spectral model of a wide sense stationary time series is developed. The parameters of this model are selected so that they most closely fit a set of Yule-Walker equations which are estimated from a finite set of time series observations. This ARMA modeling method has been found to exhibit a spectral estimation performance which is typically superior to such alternatives as the maximum entropy (AR) method, classical Fourier procedures (MA), and, the Box-Jenkins method (ARMA). One of the principal features of this spectral estimation method is the elegant algebraic structure of the linear system of equations which need to be solved when finding the ARMA model's parameters. This shift-invariant type structure gives rise to an adaptive algorithmic solution procedure whose computational efficiency is comparable to that achieved by recently developed fast AR algorithmic methods. The details of the adaptive ARMA modeling procedure will be covered in Part 2 of this paper. These dual characteristics of excellent estimation performance and real time adaptive implementation mark this method as being a primary spectral estimation tool.
Author (GRA)

N81-31928# Naval Surface Weapons Center, Dahlgren, Va.
COMPUTATION OF THE INTEGRAL OF THE BIVARIATE NORMAL DISTRIBUTION OVER ARBITRARY POLYGONS Final Report
A. R. DiDonato and R. K. Hagman Jun. 1980 237 p refs
(AD-A102466; NSWC/TR-80-166) Avail: NTIS HC A11/MF A01 CSCL 12/1

An efficient automatic procedure is given for evaluating the integral of the bivariate normal density function (IBND) over an arbitrary polygon Pi. The polygon Pi, defined by N points, falls into one or more of the following classes: -S=, simple polygons; -S-bar=, limit elements of sequences of uniformly bounded N-sided simple polygons of the same orientation; -Pi=, arbitrary polygons, including self-intersecting (SI) ones, where -S= coincides with or belongs to -S-bar= which coincides with or belongs to -Pi=. It is not necessary to specify the class beforehand. The method extracts from Pi a set of N exterior angular regions. The IBND is evaluated over each of these, and the results are properly combined to yield IBND for Pi. In case Pi is SI, account must be taken of the number of its 'primary circuits' and their orientations. A by-product of the analyses is the evaluation of a function A(Pi). Another procedure for obtaining the same final results is described for completeness which is not as efficient. It treats an SI polygon by decomposing it into a finite set of S or S-bar type elements. The IBND is evaluated over each of these; the results are properly summed to give the IBND for Pi. In contrast to the first method, the smallest class -S=, -S-bar=, -Pi= to which Pi belongs must be specified for computational efficiency. The Fortran IV programs for both procedures are presently set to yield approximately 3, 6, or 9-decimal-digit accuracy. Fortran IV listings of the programs are given.
GRA

N81-31929# Purdue Univ., Lafayette, Ind. Dept. of Mathematics.
PROBLEMS IN OPTIMAL FILTERING AND STOCHASTIC CONTROL Final Scientific Report, 1 Jun., 1977 - 31 Mar. 1981
Charles J. Holland May 1981 28 p refs
(Grant AF-AFOSR-3286-77; AF Proj. 2304)
(AD-A102478; AFOSR-81-0591TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this research we continue our investigations of approximation techniques for a wide class of discrete and continuous time stochastic control problems. Emphasis is placed on the development and theoretical justification of techniques which yield computationally tractable algorithms that answer the following: (1) approximations to the optimal cost and the cost of using particular control; (2) approximations to the optimal control; (3) evaluation of the relative performance of two controls; and (4) estimates for the deterioration in system performance due to the failure to observe system components.
Author (GRA)

N81-31930# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SOME SEQUENTIAL SELECTION PROCEDURES FOR GOOD REGRESSION MODELS
Tong-An Hsu (National Central Univ., Chung-Li, Taiwan) and Deng-Yuan Huang (Academia Sinica, Taipei, Taiwan) Jun. 1981 16 p refs Sponsored in part by the National Science Council, Republic of China
(Contract N00014-75-C-0455)
(AD-A101921; MMS-81-21) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the past decade a number of fixed sampling methods have been developed for selecting the 'best' or at least a 'good' subset of variables in regression analysis. We are interested in deriving a sequential selection procedure to select a subset of a random size including all good regression equations. Tables for an example are given at the end of this paper.
Author (GRA)

N81-31931# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SELECTION PROCEDURES FOR A PROBLEM IN ANALYSIS OF VARIANCE
Shanti S. Gupta and Deng-Yuan Huang Jun. 1981 20 p refs
(Contract N00014-75-C-0455)
(AD-A101922; MMS-81-22) Avail: NTIS HC A02/MF A01 CSCL 12/1

There are many situations in the analysis of variance where an experimenter would like to make comparisons among (and

select the 'best' set) the treatments. In this paper, we study the problem where the data are based on a completely randomized block design. It is shown that the subset selection approach is a useful method to make appropriate 'identification' among the hypotheses and the selected subset. We propose an optimal selection procedure which controls the error probabilities when all the parameters (treatments) are equal and which maximize the infimum of the probability of a correct selection over some preference parameter space, simultaneously. Some examples are provided to illustrate the optimal subset selection rule and its interpretation in terms of the 'identified' hypotheses.
Author (GRA)

N81-31932# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
SOME LOCALLY OPTIMAL SUBSET SELECTION RULES
Deng-Yuan Huang (Academia Sinica, Taipei, Taiwan) and S. Panchapakesan (Southern Illinois Univ.) Jun. 1981 21 p refs (Contract N00014-75-C-0455)
(AD-A101923; MMS-81-23) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let pi(o),pi(1),...,pi(k) be k = 1 independent populations where pi(i) has the associated density function f(x, theta sub i) with the unknown parameter belonging to an interval H of the real line. Two types of problems are studied: (1) to select from pi(1),...,pi(k) those populations, if any, that are better (to be suitably defined) than pi(o) which is the control population; and (2) to select from pi(1),...,pi(k) a subset preferably of small size so as to contain the best population. For both problems, some locally optimal selection rules are derived. The optimality criteria employed in the two problems are different. Further, the procedure for the second problem is based on ranks though the densities are assumed to be known but for the values of the parameters. The rule in the first case is applied to the special cases of (1) normal means comparison with common known variance and unequal sample sizes; (2) normal means comparison with common unknown variance and unequal sample sizes, and (3) gamma scale parameters comparison with unequal shape parameters. The rank procedure is specialized to the case of logistic distributions. Author (GRA)

N81-31933# Purdue Univ., Lafayette, Ind.
ON ELIMINATING INFERIOR REGRESSION MODELS
Deng-Yuan Huang (Academia Sinica, Taipei, Taiwan) and S. Panchapakesan (Southern Illinois Univ.) Jul. 1981 13 p refs (Contract N00014-75-C-0455)
(AD-A101924; MMS-81-25) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider a linear regression model with (p-1) predictor variables which is taken as the 'true' model. The goal is to select of all possible reduced models such that all inferior models (to be defined) are excluded with a guaranteed minimum probability. A procedure is proposed for which the exact evaluation of the probability of a correct decision is difficult; however, it is shown that the probability requirement can be met for a sufficiently large sample size. Monte Carlo evaluation of the constant associated with the procedure and some ways to reduce the amount of computations involved in the implementation of the procedure are discussed. Author (GRA)

N81-31934# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
ASYMPTOTIC (BETA) SUBd JOINT NORMALITY OF SAMPLE QUANTILES
Sadao Ikeda Jun. 1981 17 p refs
(Contract N00014-75-C-0455)
(AD-A101991; MMS-81-20) Avail: NTIS HC A02/MF A01 CSCL 12/1

Notions of asymptotic equivalence of probability distributions and some of their properties are briefly presented. By applying the results on type (beta)(d) asymptotic equivalence, asymptotic (beta)(d) joint normality of a set of increasing number of sample quantiles are discussed, which improves and refines the previous work by Ikeda and Matsunawa (1972). Author (GRA)

N81-31935# Missouri Univ. -Columbia. Dept. of Statistics.
AN ALGORITHM FOR ISOTONIC REGRESSION IN THE PLANE
Richard L. Dykstra and Tim Robertson Apr. 1981 23 p refs Prepared in cooperation with Iowa Univ., Iowa City
(Contracts N00014-78-C-0655; N00014-80-C-0321)
(AD-A102559; TR-101) Avail: NTIS HC A02/MF A01 CSCL 12/1

Algorithms for solving the isotone regression problem in two dimensions are difficult to implement because of the large number of lower sets present. A new algorithm for solving this problem, based on a simple iterative technique, is proposed and shown to converge to the correct solution. GRA

N81-31936# Missouri Univ. -Columbia. Dept. of Statistics.
ORDER RESTRICTED STATISTICAL TESTS ON MULTINOMIAL AND POISSON PARAMETERS: THE STARSHAPED RESTRICTION
Richard L. Dykstra Jun. 1981 27 p refs Prepared in cooperation with Iowa Univ., Iowa City
(Contracts N00014-80-C-0321; N00014-78-C-0655)
(AD-A102562; TR-105) Avail: NTIS HC A03/MF A01 CSCL 12/1

Likelihood ratio statistics for (i) testing the homogeneity of a collection of multinomial parameters against the alternative which accounts for the restriction that those parameters are starshaped (cf. Shaked, Ann. Statist. (1979)), and for (ii) testing the null hypothesis that this parameter vector is starshaped are considered. For both tests the asymptotic distribution of the test statistic under the null hypothesis is a version of the chi-bar-square distribution. Analogous tests on a collection of Poisson means are also found to have asymptotic chi-bar-square distributions. Author (GRA)

N81-31937# Missouri Univ. -Columbia. Dept. of Statistics.
ESTIMATION IN LATENT TRAIT MODELS
Steven E. Rigdon and Robert K. Tsutakawa May 1981 41 p refs
(Contract N00014-77-C-0097; NR Proj. 150-395)
(AD-A102216; TR-102; RR-81-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

Estimation of ability and item parameters in latent trait models is discussed. When both ability and item parameters are considered fixed but unknown, the method of maximum likelihood for the logistic or probit models is well known. This paper discusses techniques for estimating ability and item parameters when the ability parameters, or item parameters (or both) are considered random. When the item parameters are considered fixed, and the ability parameters are random, from some prior distribution with fixed but unknown parameters, the EM algorithm is applied. A modification of the EM algorithm, which requires considerably less computation, is proposed. When both ability and item parameters are considered random, the EM algorithm seems to be impractical because the amount of computation needed is very large. In this case another modification to the EM algorithm is proposed. GRA

N81-31938# Maryland Univ., College Park. Computer Vision Lab.
ON AN ESTIMATION SCHEME FOR GAUSS MARKOV RANDOM FIELD MODELS
R. Chellappa Apr. 1981 17 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A102057; TR-1040; AFOSR-81-0556TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In an earlier report a consistent estimation scheme was given for Gaussian Markov random field models. In this report we consider some statistical properties of the resulting estimate. Specifically, we derive an expression for the symptotic mean square error of the estimate for a general model and compare the efficiency of this estimate with the popular coding estimate for a simple first order isotropic model. Author (GRA)

N81-31939# Maryland Univ., College Park. Computer Vision Lab.
GENERALIZED BLOMQVIST CORRELATION Interim Report
Stanley M. Dunn Apr. 1981 21 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A102058; TR-1043; AFOSR-81-0560TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A distribution-free measure of dependence between two random variables is defined and shown to be a generalization of the quadrant measure of association. This new measure is presented as a U-statistic and its asymptotic efficiency relative to the quadrant measure is given. This measure can be used for locating edges in computer images. Author (GRA)

N81-31940# South Carolina Univ., Columbia. Dept. of Mathematics and Statistics.
NONPARAMETRIC BAYES ESTIMATION OF DISTRIBUTION FUNCTIONS AND THE STUDY OF PROBABILITY DENSITY ESTIMATES Final Report, 1 Jun. 1979 - 13 May 1981
W. J. Padgett, R. L. Taylor, and L. J. Wei 30 Jun. 1981 26 p refs
(Contract F49620-79-C-0140; AF Proj. 2304)
(AD-A102413; AFOSR-81-0592TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In work under this contract, major results were obtained in the broad areas of survival analysis and life testing, probability density estimates and laws of large numbers, estimation after testing, robustness and distribution-free procedures, and stochastic systems. In particular, nonparametric estimators of the failure rate function and survival probability were developed under the assumption of increasing failure rate using both maximum likelihood and Bayesian approaches. These particular results have attracted wide attention due to their generality and applicability in survival analysis and reliability estimation from arbitrarily right-censored data. Also, consistency results for both univariate and multivariate kernel estimates for probability density functions and regression functions were obtained using techniques and results of function-space probability theory. Stochastic convergence results for weighted sums of random elements in various function spaces were also obtained. Sequential procedures were developed and analyzed which provided interval estimators of the parameter of interest after testing certain hypotheses. Various robustness and nonparametric methods for incomplete samples and broken samples were studied, as well as nonparametric repeated significance testing and randomized block designs. Thus, maintenance policies and development of new, more reliable, equipment may be formulated using the statistical procedures and theory from these results. Author (GRA)

N81-31941# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
COMPUTATIONALLY FAST ALGORITHMS FOR ARMA SPECTRAL ESTIMATION
Koji Ogino and James A. Cadzow Jun. 1981 188 p refs
(Contract N00014-80-C-0303)
(AD-A102489; Rept-8) Avail: NTIS HC A09/MF A01 CSCL 12/1

Various procedures for effecting a rational spectral model of a stationary time series are presented. In particular, the new high performance ARMA modeling method is detailed and its superior spectral estimation performance relative to the AR maximum entropy and Box-Jenkins ARMA method is demonstrated. The major contribution of this report is the development of a super fast adaptive algorithm for implementing the high performance ARMA algorithm thereby making real time estimates feasible. Author (GRA)

N81-31942# Stanford Univ., Calif. Dept. of Statistics.
LARGE DEVIATION PROBABILITIES FOR CERTAIN DEPENDENT PROCESSES
Kesar Singh 27 Mar. 1981 20 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A102166; TR-300) Avail: NTIS HC A02/MF A01 CSCL 12/1

Certain results on large deviation probabilities for linear and m-dependent processes are considered here. Author (GRA)

N81-31943# Stanford Univ., Calif. Dept. of Statistics.
CHARACTERIZATIONS AND GOODNESS OF FIT TESTS
Federico J. OReilly and Michael A. Stephens 2 Jun. 1981 22 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A102167; TR-302) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this article a systematic approach to providing goodness of fit tests is discussed, for the composite goodness of fit problem of testing that the distribution F of a random sample comes from a parametric family F sub O. Characterization procedures are emphasized, and it is shown that, at least for the exponential case, invariant characterizations appear to be better than those which are not invariant. A general technique is developed for producing invariant characterizations and for the exponential case it is shown how these are related to characterizations already in the literature. Power studies are given to examine the tests based on both invariant and non-invariant characterizations. Author (GRA)

N81-31944# Stanford Univ., Calif. Dept. of Statistics.
A PARAMETRIC ANALYSIS OF STRUCTURED AND UNSTRUCTURED Q-SORT DATA
William D. Heavlin 9 Jun. 1981 75 p refs
(Contract N00014-76-C-0475)
(AD-A102169; TR-303) Avail: NTIS HC A04/MF A01 CSCL 12/1

The operation of sorting the items of a Q-set according to their similarity to a given object is idealized by a system of axioms. As a consequence of this axiom system, a stochastic model of Q-sorting behavior is derived. This model, with its associated axioms, resembles in some respects the preference model of Luce; the two are compared at length. GRA

N81-31945# Stanford Univ., Calif. Dept. of Statistics.
TABLES OF SIGNIFICANCE POINTS FOR THE VARIANCE WEIGHTED KOLMOGOROV-SMIRNOV STATISTICS
Heinrich Niederhausen 19 Feb. 1981 61 p refs
(Contract N00014-76-C-0475)
(AD-A102052; TR-298) Avail: NTIS HC A04/MF A01 CSCL 12/1

A Kolmogorov-Smirnov statistic with the weight factor F(x)(1-F(x)), referred to as 'variance-weighted', is described. Tables of the exact significance points are given for various one and two sample cases. M.G.

N81-31946# Stanford Univ., Calif. Dept. of Statistics.
THE CLASSIFICATION AND MIXTURE MAXIMUM LIKELIHOOD APPROACHES TO CLUSTER ANALYSIS
G. J. McLachlan 12 Mar. 1981 24 p refs Submitted for publication
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A102084; TR-299) Avail: NTIS HC A02/MF A01 CSCL 12/1

A review is undertaken of two maximum likelihood approaches to cluster analysis, the so-called classification and mixture maximum likelihood methods. The basic assumptions of the two approaches and their associated properties are contrasted, in particular for multivariate normal component distributions. The problem of deciding how many clusters there are is discussed for each approach. Also, an account is given of the relative efficiency of the mixture approach to clustering. Author (GRA)

N81-31947# Stanford Univ., Calif.
LARGE DEVIATIONS FOR BOUNDARY CROSSING PROBABILITIES
D. Siegmund 15 May 1981 25 p refs
(Contract N00014-17-C-0306; Grant NSF MCS-80-24649)
(AD-A102142; TR-15) Avail: NTIS HC A02/MF A01 CSCL 12/1

For random walks s sub n, n=1,2,... whose distribution can be imbedded in an exponential family, a method is described for determining the asymptotic behavior as m goes to infinity of P(s sub n = m c(n/m) for some n < m such that s sub m = m micron sub o) (micron sub 0 < c(1)). Applications are given to the distribution of the Smirnov statistic and to modified repeated significance tests. Author (GRA)

N81-31948# Stanford Univ., Calif. Dept. of Statistics.
TESTS FOR STANDARDIZED GENERALIZED VARIANCES OF MULTIVARIATE NORMAL POPULATIONS OF POSSIBLY DIFFERENT DIMENSIONS
Ashis Sen Gupta Feb. 1981 48 p refs Presented at Conf. on Appl. of Numerical Analysis and Special Functions in Statistics, College Park, Md., 6 Oct. 1980

(Contract N00014-75-C-0442; Grant NSF SES-79-13976; NR Proj. 042-034)
(AD-A102021; TR-50) Avail: NTIS HC A03/MF A01 CSCL 12/1

The concept of Standardized Generalized Variances (SGV's) is introduced. Several new problems of multivariate statistical inference are formulated on the basis of these SGV's. It is shown that in addition to providing several new statistical tests, many existing problems of multivariate tests of significance can be regarded as special cases of these formulations and can also be extended to their full generalities. Considering multivariate normal populations with general covariance matrices, likelihood ratio tests are derived for SGV's. The criteria turns out to be elegant multivariate analogues to those for tests of variances in the univariate case. A multivariate F sub max criterion is also presented as an alternative shortcut method for the case of k populations. The null and nonnull distributions of the test criteria are deduced in computable forms (see, e.g., Mathai et al. (1979)) in terms of special functions, e.g., Pincherle's H-function, Meijer's G-function, etc., by exploiting the theory of calculus of residues. Some large sample approximations to these distributions are also proposed. The property of unbiasedness for the modified likelihood ratio tests is established for some of the above test criteria. Finally, applications of the above tests to a wide spectrum of applied research are illustrated by examples taken from the existing literature, e.g., Gnanadesikan (1977), Gnanadesikan and Gupta (1970), etc. Author (GRA)

N81-31949# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical and Computer Engineering.
AN ADAPTIVE ARMA SPECTRAL ESTIMATOR, PART 2
James A. Cadzow and Randolph L. Moses Jun. 1981 10 p refs Presented at Conf.
(Contract N00014-80-C-0303)
(AD-A101870; Rept-10) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents a recursive algorithmic implementation of the prewindowed high performance method of ARMA spectral modeling as described in Part 1. This algorithm provides updates of the ARMA models optimal autoregressive coefficients (in actuality prediction errors) as each new data point becomes available. The algorithm is computationally fast in the sense that it requires O(p) multiplications and additions for each update. It is shown that this fast recursive algorithm may be implemented using a lattice filter arrangement, and it therefore exhibits several of the 'nice' properties associated with lattice type algorithms such as numerical robustness and good convergence properties. Author (GRA)

N81-31950# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON COUPLING OF DIFFUSION PROCESSES
Torgny Lindvall 1981 22 p refs
(CTH-Math-1981-1) Avail: NTIS HC A02/MF A01

The asymptotics of one dimensional diffusion processes are studied by the coupling method. Being diffusion skip-free, the analysis is similar to that of birth and death processes which have also been studied by the coupling method. Let Ql(t) and Qm(t) be distributions of a diffusion X(t) for t equal or greater than zero, when l and m are initial distributions. It is proved by the coupling method that the total variation norm Ql(t)-Qm(t) tends to zero as t tends to infinity under appropriate moment conditions on l and m and certain stopping times for X.
Author (ESA)

N81-31951# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands). Afdeling Wageningen.
THE FIRST FOUR MOMENTS OF A DISTRIBUTION [DE EERSTE VIER MOMENTEN VAN EEN VERDELING]
A. Keen Delft Netherlands Organization for Applied Scientific Research TNO Dec. 1979 26 p refs In DUTCH
(IWIS-TNO-A-79-ST-66-36) Avail: NTIS HC A03/MF A01

The relationship between a distribution and its first four moments is studied. Application is important in testing situations where an unknown distribution can be assimilated with a known one with the same moments, and from which critical domain and discrimination can be approximated. The degree to which a distribution can be characterized by its first four moments is evaluated by means of examples and the meaning of skewness and kurtosis is illustrated. The estimators of the four moments for a random sample from an infinite population are defined and their properties derived for normal and arbitrary distributions. The theory is then applied to testing for departure from normality. This is found to be of particular importance for checking the applicability of such standard procedures as t- and F-testing. Skewness has little effect on F-tests, whereas t-tests are hardly affected by kurtosis. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N81-31952*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON REGULATORS WITH A PRESCRIBED DEGREE OF STABILITY M.S. Thesis
Peng-Teng Peter Ng Aug. 1981 220 p refs
(Contract DE-AC01-78RA-03395; Grant NGL-22-009-124)
(NASA-CR-164732; LIDS-TH-1129) Avail: NTIS HC A10/MF A01 CSCL 12B

Several important aspects of the Regulator with a Prescribed Degree of Stability (RPDS) methodology and its applications are considered. The solution of the time varying RPDS problem as well as the characterization of RPDS closed loop eigenstructure properties are obtained. Based on the asymptotic behavior of RPDS root loci, a one step algorithm for designing Regulators with Prescribed Damping Ratio (RPDR) is developed. The robustness properties of RPDS are characterized in terms of the properties of the return difference and the inverse return difference matrices for the RPDS state feedback loop. This class of regulators is found to possess excellent multiloop margins with respect to stability and degree of stability properties. The ability of RPDS design to tolerate changing operating conditions and unmodelled dynamics are illustrated with a multiterminal dc/ac power system example. The output feedback realization of RPDS requires the use of Linear Quadratic Gaussian (LQG) methodology. S.F.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N81-31953# Naval Ship Research and Development Center, Annapolis, Md. Propulsion and Auxiliary Systems Dept.
STABILITY CHARACTERISTICS OF EPOXY-IMPREGNATED SUPERCONDUCTING MAGNETS
D. J. Waltman, M. J. Superzynski, and F. E. McDonald Jun. 1981 24 p refs
(SO380SL001)
(AD-A102419; DTNSRDC/PAS-80/42) Avail: NTIS HC A02/MF A01 CSCL 20/3

Epoxy-impregnated superconducting magnets can be subjected to energy inputs from external sources or from stored energy released in the coil composite. If the energy released is sufficiently large, the temperature will rise locally driving the superconductor normal causing a magnet quench. Several superconducting coils were constructed to determine the magnitude and size of disturbances required to cause a quench. These coils were wound from multifilament, niobium titanium conductor and epoxy impregnated and fiber glass reinforced. Small electrical heaters

of various sizes were embedded in the coils to initiate a normal zone. These coils were placed in a background magnetic field ranging in flux density from 0 to 5.5 T, and the energy required to cause a quench was determined as a function of the ratio of operating current to critical current at a constant field. The different size heaters allowed the energy to be distributed over various conductor volumes, and the effects of the energy spatial distribution were determined. Author (GRA)

N81-31954# Lowell Univ., Mass.
ANALYSIS AND COMPUTER STUDIES FOR MAGNETOSTATIC SURFACE WAVE TRANSDUCERS Interim Report
Jacob I. Weinberg Griffiss AFB, N.Y. RADC May 1981 104 p refs
(Contract F19628-80-C-0029; AF Proj. 2305)
(AD-A102207; RADC-TR-81-96) Avail: NTIS HC A06/MF A01 CSCL 20/3

This report summarizes results of work on magnetostatic surface wave transducers. Presented are the results for the dispersion relation, radiation resistance and insertion loss for magnetostatic surface wave transducers which may include a gap and apodization. Independent conductors as well as normal modes are considered. Also presented are the results for the dispersion relation for surface waves for a variety of alignments of the externally applied magnetic biasing field. Computerized graphs of the results are presented here. Comparisons are made with results obtained from the analysis of the microstrip model which is also presented. Author (GRA)

N81-31955# Army Research and Development Group (Europe), FPO New York 09510.
THE 4TH INTERNATIONAL WORKSHOP ON RARE-COBALT PERMANENT MAGNETS AND THEIR APPLICATION
Frederick Rothwarf 19 Mar. 1981 31 p Conf. held in Hakone, Japan Sponsored in part by Office of Naval Research, Tokyo Group, APO San Francisco
(PB81-196024) Avail: NTIS HC A03/MF A01 CSCL 09A

A broad overview is presented of papers which cover: electrical applications; medical applications; magnetic properties; magnetic after effect; structures and coercivity; permanent magnets; and resources and refining of rare earth elements. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N81-31956*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF BLADE-VANE RATIO AND ROTOR-STATOR SPACING OF FAN NOISE WITH FORWARD VELOCITY
Richard P. Woodward and Frederick W. Glaser Aug. 1981 21 p refs Presented at the 7th Aeroacoustic Conf., Palo Alto, Calif., 5-7 Oct. 1981; sponsored by AIAA
(NASA-TM-82690; E-971) Avail: NTIS HC A02/MF A01 CSCL 20A

A research fan stage was acoustically tested in an anechoic wind tunnel with a 41 m/sec tunnel flow. Two stator vane numbers giving cut-on and cut-off conditions were tested at three rotor-stator spacings ranging from about 0.5 to 2.0 rotor chords. These two stators were designed for similar aerodynamic performance. Hot film anemometer turbulence measurements were made at the leading edge of the stator for each spacing. The cut-off criterion strongly controlled the fundamental tone level at all spacings. The trends with spacing of the wake defect upwash component at the stator tip showed good agreement with the corresponding cut-on acoustic tone levels. Author

N81-31957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBOMACHINERY NOISE STUDIES OF THE AIRESEARCH QCGAT ENGINE WITH INFLOW CONTROL
J. G. McArdle, L. Homyak, and D. D. Chrulski 1981 26 p refs Presented at the 7th Aeroacoustic Conf., Palo Alto, Calif., 5-7 Oct. 1981; sponsored by AIAA
(NASA-TM-82694; E-977) Avail: NTIS HC A03/MF A01 CSCL 20A

The AiResearch Quiet Clean General Aviation Turbofan engine was tested on an outdoor test stand to compare the acoustic performance of two inflow control devices (ICD's) of similar design, and three inlet lips of different external shape. Only small performance differences were found. Far-field directivity patterns calculated by applicable existing analyses were compared with the measured tone and broadband patterns. For some of these comparisons, tests were made with an ICD to reduce rotor/inflow disturbance interaction noise, or with the acoustic suppression panels in the inlet or bypass duct covered with aluminum tape to determine hard wall acoustic performance. The comparisons showed that the analytical expressions used predict many directivity pattern features and trends, but can deviate in shape from the measured patterns under certain engine operating conditions. Some patterns showed lobes from modes attributable to rotor/engine strut interaction sources. Author

N81-31958# Pennsylvania State Univ., University Park. Applied Research Lab.
ACOUSTIC RADIATION AND DIFFRACTION FROM CONVEX AND CONCAVE DOMES Ph.D. Thesis - Aug. 1981 Technical Memo, period ending Aug. 1981
Hideyo Suzuki 21 Mar. 1981 162 p refs
(Contract N00024-79-C-6043)
(AD-A102295; ARL/PSU-TM-81-110) Avail: NTIS HC A08/MF A01 CSCL 20/1

The effects of the diaphragm shape of a loudspeaker on the radiation and diffraction characteristics are discussed using convex and concave domes in an infinite baffle. The least square error method, one of the weighted residual methods, is employed as the mathematical tool for the solution of the problems. The results show that these characteristics are highly dependent on the shape of the diaphragm, even if it vibrates like a piston. The response of the concave dome has a wide peak due to the cavity resonance, resulting in higher radiation efficiency. The convex dome has lower on-axis pressure response in the same region due to the dispersion of energy to the off-axis direction. The diffraction of sound from a concrete ring source by the convex and concave domes is also investigated in order to discuss the interaction between the loudspeaker units of a complete system. The convex dome has much larger diffraction effects than the concave dome, especially in the high-frequency region. It is shown that even the concave dome produces a discernible amount of amplitude distortion of sound radiated from an adjacent source. The radiation and diffraction phenomena are well explained by the use of a graphical representation of the energy flow and pressure distribution. Author (GRA)

N81-31959# Rolls-Royce Ltd., Derby (England). Div. of Noise Technology.
PRESENTATION TO THE EUROPEAN UNION AGAINST AIRCRAFT NUISANCES
M. J. T. Smith 22 Nov. 1980 13 p refs Conf. Held in London, 22 Nov. 1980
(PNR-90064) Avail: NTIS HC A02/MF A01

The jet engine noise reduction achieved by the aircraft industry is discussed. A 100 fold change in acoustic energy is claimed for the high bypass ratio turbofan. The areas of contour of constant noise level at airports are given for a range of typical in-service and emerging aircraft. The replacement of existing aircraft by aircraft powered with modern technology engines would not only produce a significant improvement in the noise situation, but it would reduce fuel consumption by some 30%.
Author (ESA)

N81-31459# Human Engineering Labs., Aberdeen Proving Ground, Md.
THE BACKGROUND AND BASES FOR THE PROPOSED MILITARY STANDARD ON ACOUSTICAL NOISE LIMITS IN HELICOPTERS
Georges R. Garinther and David C. Hodge *In* AGARD Aural Commun. in Aviation Jun. 1981 9 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

N81-31470# Southampton Univ. (England). Inst. of Sound and Vibration Research.
AN ACTIVE NOISE REDUCTION SYSTEM FOR AIRCREW HELMETS
P. D. Wheeler and S. G. Halliday *In* AGARD Aural Commun. in Aviation Jun. 1981 8 p ref Sponsored in part by Ministry of Defense (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

N81-31473# Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.
FLYING HELMET ATTENUATION, AND THE MEASUREMENT, WITH PARTICULAR REFERENCE TO THE Mk 4 HELMET
G. M. Rood *In* AGARD Aural Commun. in Aviation Jun. 1981 13 p refs (For primary document see N81-31449 22-32)
Avail: NTIS HC A09/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N81-31960 Florida Univ., Gainesville.
MONTE CARLO CALCULATION OF THE BORN-OPPENHEIMER POTENTIAL BETWEEN TWO HELIUM ATOMS Ph.D. Thesis
Rex Everett Lowther 1980 110 p
Avail: Univ. Microfilms Order No. 8115650

The results of the calculations of extremely accurate wave functions for the ground state of two helium atoms, including energies obtained from these wave functions, are presented. These energies provide a variational upper bound to the Born-Oppenheimer Potential curve for this system. The necessary expectation values were calculated by biased Monte Carlo techniques at seven internuclear distances. The energy obtained from the trial wave function at the potential minimum is -11.6149685 + or - 0.0000030 Ry giving a well depth of -7.10 + or - 30 times to the minus 5th power Ry at the nuclear separation distance of 5.6 Bohr radii (a sub B). It is estimated that this energy is above the energy of the exact wave function by no more than 1.8 x 10 to the minus 6th power Ry. Dissert. Abstr.

N81-31961 Maryland Univ., College Park.
MATRIX ISOLATION SPECTRA AND STRUCTURES OF UNSTABLE MOLECULES Ph.D. Thesis
David Donald Stranz 1980 193 p
Avail: Univ. Microfilms Order No. 8117383

Techniques for obtaining infrared, ultraviolet-visible, and Raman spectra of unstable or reactive molecular species trapped in frozen inert gases are described. Monomeric and small multimeric clusters were generated from vapors of high temperature solids and free radicals produced by electric discharge and vacuum-ultraviolet photolysis. Vaporization and condensation products of silicon monoxide were examined in detail. Infrared and Raman spectra were recorded for the species SiO, Si2O2, and Si2O3, and the transition from molecular to bulk clusters was followed through extended diffusion and reaction in the matrix solid. The molecular structures are analyzed. The implications to interstellar chemistry are discussed. Experiments on co-condensation of vaporization products of solid Mg and SiO were begun. Initial results indicated formaton of MgSiO, MgOSi, Mg2SiO, and MgSi2O2 species. Diffusion studies indicated a transition to a bulk solid with an infrared spectrum similar to that of interstellar media. Resonance Raman spectra of the trapped products of solid tin and lead vaporization were obtained. Infrared spectra of CO3 were obtained. Dissert. Abstr.

N81-31962# Fermi National Accelerator Lab., Batavia, Ill.
FIXED POINTS: FERMION MASS PREDICTIONS
C. T. Hill May 1981 8 p refs Presented at the 2nd Workshop on Grand Unification, Ann Arbor, Mich., Apr. 1981
(Contract DE-AC02-76CH-03000)
(FERMILAB-Conf-81/44-THY; CONF-810485-1) Avail: NTIS HC A02/MF A01

The renormalization group equations for heavy fermion Higgs-Yukawa coupling constants possess low energy fixed points. The masses of fourth generation quarks and leptons, or an ultra heavy top quark are predicted. These also correspond to upper bounds on fermion masses in SU(5)-like theories. DOE

N81-31963# Los Alamos Scientific Lab., N. Mex.
LOS ALAMOS SYNCHRONOUS ORBIT DATA SET
D. N. Baker, P. R. Higbie, R. D. Belian, E. W. Hones, Jr., and R. W. Klebesadel 1981 31 p refs Presented at the IMS Assessment Symp., Greenbelt, Md., 21-23 May 1981
(Contract W-7405-eng-36)
(LA-UR-81-1453; CONF-810585-1) Avail: NTIS HC A03/MF A01

Energetic electron (30-15000 keV) and proton 145 keV to 150 MeV) measurements made by Los Alamos National Laboratory sensors at geostationary orbit (6.6 R sub E) are summarized. The instrumentation employed and the satellite positions are described. The spacecraft have been variously located, but in their present configuration the Los Alamos satellites designated 1976-059, 1977-007, and 1979-053 are located, respectively, at approximately 70 W, 70 E, and approximately 135 W longitude. Several examples of the high temporal and full three dimensional spatial measurement capabilities of these instruments are illustrated by examples from the published literature. Discussion is also given for the Los Alamos Synoptic Data Set (SDS) which gives a broad overview of the Los Alamos geostationary orbit measurements. The SDS data are plotted in terms of daily average spectra, 3-hour local time averages, and in a variety of statistical formats. DOE

N81-31964# Argonne National Lab., Ill. Physics Div.
USING AN ELECTROSTATIC ACCELERATOR TO DETERMINE THE STEREOCHEMICAL STRUCTURES OF MOLECULAR IONS
Donald S. Gemmell 1980 8 p refs Presented at the 6th Conf. on Application of Accelerators in Res. and Ind., Denton, Tex., 3-5 Nov. 1980
(Contract W-31-109-eng-38)
(CONF-801111-43) Avail: NTIS HC A02/MF A01

Bond lengths were determined for several diatomic projectiles (H2(+), HeH(+), CH(+), NH(+), OH(+), N2(+), O2(+), etc.) with an accuracy of 0.01 A. The H3(+) was demonstrated to be equilateral triangular and the interproton distance measured. Measurements on single fragments from CO2(+), N2O(+), C3H3(+), and CH sub n(+) revealed the gross structures of the projectiles. An apparatus to permit precise measurements on fragments in coincidence was tested on a known structure, OH2(+). The O-H bond length was found to be 1.0 + or - 0.04 A and the H-O-H bond angle was measured as 110 + or - 2 deg. These values are in excellent agreement with those found in optical experiments. This Coulomb explosion technique can be expected to be refined in accuracy and to be extended to a wide range of molecular ions whose structures are inaccessible by other means. DOE

N81-31965# Argonne National Lab., Ill. Physics Div.
PHYSICS WITH FAST MOLECULAR-ION BEAMS
Elliot P. Kanter 1980 8 p refs Presented at the 6th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Texas, 3-5 Nov. 1980
(Contract W-31-109-eng-38)
(CONF-801111-44) Avail: NTIS HC A02/MF A01

Fast (MeV) molecular-ion beams provide a unique source of energetic projectile nuclei which are correlated in space and time. The recognition of this property has prompted several investigations of various aspects of the interactions of these ions with matter. High resolution measurements on the fragments resulting from these interactions have already yielded a wealth of new information on such diverse topics as plasma oscillations in solids and stereochemical structures of molecular ions as well as a variety of atomic collision phenomena. The general features of several such experiments are discussed and results are presented. DOE

N81-31966# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.

STUDY OF RARE PROCESSES INDUCED BY 209-Gev MUONS Ph.D. Thesis
Wesley Harold Smith May 1981 112 p refs
(Contract W-7405-eng-48)
(LBL-12789) Avail: NTIS HC A06/MF A01

Analysis of dimuon final states from positive and negative 209-Gev muons in a magnetized iron calorimeter has set a lower limit of 9 Gev/sq cm on the mass of a heavy neutral muon and a 90% confidence level upper limit for the production of bottom hadrons by muons. The dimuon mass spectrum from 102,678 trimuon final states places a 90% confidence level upper limit for the muoproduction of upsilon states. Analysis of 71 rare multimuon events, including 4 and 5 muon final states, is presented. DOE

N81-31967# Stanford Linear Accelerator Center, Calif.
OBSERVATION OF NEW RESONANCE STRUCTURE IN THE NATURAL SPIN PARITY STRANGE MESON SYSTEM
B. N. Ratcliff, D. Ashton, R. Carnegie, W. Dunwoodie, S. Durkin, P. Estabrooks, T. Fieguth, R. J. Hemingway, A. Homma, and D. Hutchinson Apr. 1981 8 p refs Presented at 16th Recontre de Moriond: Nonperturbative QCD: Theory and Experiment, Les Arcs, France, 15-27 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-PUB-2729) Avail: NTIS HC A02/MF A01

Data from the LASS spectrometer are presented on the reaction K(-)p yields K(-) pi(+)n. An energy independent partial wave analysis of this data yields unique K(-)pi(+) scattering partial wave amplitudes in the invariant mass region from 0.7 GeV to 1.8 GeV, and two distinguishable sets of amplitudes between 1.8 GeV and 2.3 GeV. These amplitudes confirm all of the well known Kpi resonances, and display clear evidence for new resonance structure in the S, P and G waves in the mass region above 1.6 GeV. DOE

N81-31968# Ohio State Univ., Columbus. Dept. of Physics.
HYPERPIONS AT THE Z(0)
Kenneth Lane 1980 18 p refs Presented at the Workshop on Expectations for Z/sup o/Physics, Ithaca, N.Y., 6-8 Feb. 1980
(Contract DE-AC02-76ER-01545)
(DOE/ER-01545/306; CONF-800274-1) Avail: NTIS HC A02/MF A01

The production and detection of hyperpions in the continuum, at toponium, and at the Z(0) are discussed. The process Z(0) yields (charged pair) occurs in approximately 1% of Z(0) decays and is the most promising means for their discovery. DOE

N81-31969# Fermi National Accelerator Lab., Batavia, Ill.
QUARK-ANTIQUARK POTENTIAL AND QUANTUM CHROMODYNAMICS
W. Buchmueller and S. H. H. Tye (Cornell Univ., Ithaca, N.Y.) Apr. 1981 19 p refs Presented at the Conf. on Perturbative Quantum Chromodynamics, Tallahassee, Fla., 25-28 Mar. 1981
(Contract DE-AC02-76CH-03000)
(FERMILAB-CONF-81/38-THY; CONF-810368-2) Avail: NTIS HC A02/MF A01

The quark-antiquark potential in quantum chromodynamics is discussed with particular emphasis on the related beta function. The empirical information about the potential at intermediate distances, due to the psi- and tau-spectroscopies, is reviewed. Finally, the quantitative connection between the zeta-spectroscopy, formed by the anticipated t-quark and its antiquark, and the short distance behavior of the quark-antiquark potential is examined. DOE

N81-31970# Argonne National Lab., Ill. Applied Physics Div.
INTERPRETATION AND NORMALIZATION OF EXPERIMENTAL DATA FOR TOTAL, SCATTERING, AND REACTION CROSS SECTIONS
P. T. Guenther, W. P. Poenitz, and A. B. Smith 1980 34 p refs Presented at the Workshop on Nucl. Data Evaluation Methods and Procedures, Upton, N.Y., 22-25 Sep. 1980
(Contract W-31-109-eng-38)
(CONF-800979-20) Avail: NTIS HC A03/MF A01

Problem areas in the interpretation of fast neutron data are discussed. Their impact on experimental uncertainties and hence the evaluation process are reviewed in the context of user needs. Contributions of supplementary information such as nuclear models and applications tests are explored. Specific means for resolving difficulties cited are proposed and illustrated. DOE

N81-31971# Ames Lab., Iowa.
REPORT OF THE REVIEW PANEL ON NEUTRON SCATTERING
22 Oct. 1980 86 p
(Contract W-7405-eng-82)
(IS-4761) Avail: NTIS HC A05/MF A01

This panel finds that neutron scattering continues to play a central role in advanced research in the materials sciences. The steady-state reactors at Brookhaven National Laboratory and Oak Ridge National Laboratory are seen as the mainstays of neutron scattering research programs for at least the next decade. The constant level of funding of these two facilities during the 1970's has not allowed the kind of instrumentation and innovation necessary for continued vitality. The panel concludes that a plan for the systematic development of this field would provide for the enhanced funding and development of the two reactor sources and both pulsed sources, and the panel strongly urges DOE to provide this level of funding, or at least ensure the vitality of the steady-state sources. DOE

N81-31972# Sandia Labs., Albuquerque, N. Mex.
ELECTRON ENERGY-DISTRIBUTION FUNCTIONS IN GASES
L. C. Pitchford 1981 9 p refs Presented at the 2nd Intern. Swarm Seminar, Oak Ridge, Tenn., 22 Jul. 1981 Sponsored in part by National Center for Atmospheric Research, Boulder, Colo.
(Contract DE-AC04-76DP-00789)
(CONF-810720-1) Avail: NTIS HC A02/MF A01

Numerical calculation of the electron energy distribution functions in the regime of drift tube experiments is discussed. Constant applied fields and values of E/N (ratio of electric field strength to neutral density) low enough that electron growth due to ionization can be neglected (GHT) are considered. DOE

N81-31973# General Atomic Co., San Diego, Calif.
DOPPLER ION PROGRAM DESCRIPTION
P. Henline Dec. 1980 65 p refs
(Contract DE-AT03-76ET-51011)
(GA-A-16140) Avail: NTIS HC A04/MF A01

The Doppler spectrometer is a conventional Czerny-Turner grating spectrometer with a 1024 channel multiple detector. Light is dispersed across the detector, and the output yields a spectrum covering approximately 200 A. The width of the spectral peak is directly proportional to the temperature of the emitting ions, and determination of the impurity ion temperature allows one to infer the plasma ion temperature. The Doppler ion software system developed at General Atomic uses a TRACOR Northern 1710-31 and an LSI-11/2. The exact configuration of Doublet 3 is different from TRACOR Northern systems at other facilities. DOE

N81-31974# Los Alamos Scientific Lab., N. Mex.
COMPARISON OF MEASURED EMITTANCE OF AN H(-) ION BEAM WITH A SIMPLE THEORY
Paul Allison, Joseph D. Sherman, and H. Vernon Smith, Jr. Jun. 1981 13 p refs
(LA-8808-MS) Avail: NTIS HC A02/MF A01

Ion beam phase space is frequently modeled with a simple theory having a few parameters; for example, the Kapchinskii-Vladimirskii (K-V) equations. For a real beam the normalized phase space density par. delta(2) i/par. delta x par. delta in one transverse plane x, averaged over the other plane y, is usually far from that of a K-V distribution. A simple theory based on plasma ion temperature that under some conditions gives a good description of the measured emittance of the H(+) ion beam at about 15 keV is developed. DOE

N81-31975# Kentucky Univ., Lexington. Dept. of Chemistry.
ELECTRON PHOTOEJECTION IN CARBANIONS Progress Report, 1 Jul. 1980 - 31 Jun. 1981
Laren M. Tolbert 1981 24 p refs
(Contract DE-AS05-79ER-10424)
(DOE/ER-10424/1) Avail: NTIS HC A02/MF A01

Despite formidable energetic constraints, resonance-stabilized carbanions are able to transfer electrons to dimethyl sulfoxide with moderately high efficiencies. An unusually long lifetime for the carbanion photoactive state was discovered which partially explains the ability of an endothermic irreversible electron transfer to draw off excitation energy. A corollary to this result is that exoergonic electron acceptors are able to quench the excited state with extremely high efficiency. The efficiency of electron transfer is not clearly related to the formal ground state potential of the carbanions as measured by basicity. A new class of anions, the 2-aryl-1, 3-diphenylpropenyl anions, can permit better separation of ground state effects from excited state effects. Significant observations were made on the reactivity of radicals with anions, we have a method for calibration of photodetectors using disc calorimetry and computer techniques was developed. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N81-31976# JAYCOR, Alexandria, Va.
EXPERIMENTAL STUDIES OF AUTOACCELERATION CONCEPTS Progress Report, 14 Mar. 1980 - 14 Mar. 1981
Fredrick Sandel 5 Jun. 1981 77 p
(Contract N00173-80-C-0099)
(AD-A101913; J206-01-006-FR) Avail: NTIS HC A05/MF A01 CSCL 20/7

A long pulse intense electron beam propagating in a strong axial magnetic field has been studied. Significant electrostatic neutralization f sub c about 0.5 has been observed with electrostatic probes and the presence of an ion background at the end of the pulse verified by magnetic spectrometer experiments. The drift tube wall is being bombarded by energetic electrons and ions during the beam risetime and these electrons and ions fluxes may provide the ions at the wall necessary to neutralize the beam. A model has been developed which explains the ion bombardment during the beam pulse. The source of the electron flux to the wall of the drift tube appears to be from the end of the tube with electrons inside the drift tube rapidly diffusing radially to the wall over the entire length of the experiment. The magnitude of the electron flux is strongly influenced by the material used to dump the beam and the geometry of the beam dump. GRA

N81-31977# Illinois Univ., Urbana. Fusion Studies Lab.
PARTICLE-CONFINEMENT CRITERIA FOR AXISYMMETRIC FIELD-REVERSED MAGNETIC CONFIGURATIONS
M. Y. Hsiao and G. H. Miley 1981 19 p refs Presented at the Controlled Fusion Theory Conf., Austin, Tex., 8-10 Apr. 1981
(Contract DE-AS02-76ET-52040)
(CONF-810450-1; COO-2218-214) Avail: NTIS HC A02/MF A01

The criteria for closed-field and open-field confinements are obtained including both the lower and upper bounds of P sub theta/q where q is the charge of the particle. The constraint on P sub theta/q represents a necessary condition for particle confinement. In certain limits, the commonly used criterion for Hamiltonian is deduced from a more general form as a special case. The results can be applied to calculations for field-reversed mirrors and field-reversed theta pinches. DOE

N81-31978# California Univ., Livermore. Lawrence Livermore Lab.
NEUTRAL-BEAM INJECTORS FOR 1990 AND 2005
J. H. Fink (Westinghouse Electric Corp., Pittsburgh) 1 Apr. 1981 69 p refs
(Contract W-7405-eng-48)
(UCRL-53112) Avail: NTIS HC A04/MF A01

Anticipated developments in neutral beam technology are described. Particular attention is given to gas efficiency, power efficiency, beam optics, and injector size. It is concluded that negative ion sources can be made to operate with gas efficiencies in excess of 10 percent, while negative ion neutral beam injectors, using D2 gas stripping cells, will operate at power efficiences of roughly 50 percent in ten years. Twenty-five years from now, negative ion neutral beam injectors, using photodetachment, will operate at efficiencies approaching 70 percent. DOE

N81-31979# California Univ., Livermore. Lawrence Livermore Lab.
THRESHOLDS AND Q VALUES OF NUCLEAR REACTIONS INDUCED BY NEUTRONS, PROTONS, DEUTERONS, TRITONS He-3 IONS, ALPHA PARTICLES, AND PHOTONS, VOLUME 24
R. J. Howerton 25 Mar. 1981 7 p
(Contract W-7405-eng-48)
(UCRL-50400-Vol-24) Avail: NTIS HC A02/MF A01

The 1977 Wapstra and Bos nuclear mass data tables were used to derive tables for thresholds and Q values of nuclear reactions induced by neutrons, protons, deuterons, tritons, He-3 ions, alpha particles, and photons. DOE

N81-31980# Stanford Linear Accelerator Center, Calif.
HIGH-CURRENT, SHORT-PULSE, RF-SYNCHRONIZED ELECTRON GUN FOR THE STANFORD LINEAR ACCELERATOR
C. K. Sinclair and Roger H. Miller Feb. 1981 3 p refs Presented at the Particle Accelerator Conf., Washington, D.C., 11-13 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-PUB-2705; CONF-810314-161) Avail: NTIS HC A02/MF A01

For the generation of intense single and multiple bunches of electrons (> 8 nc per bunch) for accelerator studies at SLAC, a high peak current photoemission electron gun was developed. A gallium arsenide photocathode was illuminated by the optical beam from a frequency doubled, actively mode locked and Q-switched Nd:YAG laser. The mode locked optical pulses were of variable, subnanosecond width and occur with a spacing of 8.4 nsec, synchronized with the 2856 MHz accelerator RF. The gun was designed to be space charge limited at 15 A and 200 kV, although emission of 60 A was obtained with a 57 kV test structure, corresponding to a current density of 180 A/sq cm. With the proper choice of laser wavelength, the electron beam may be 40 percent longitudinally polarized. DOE

N81-31981# Rensselaer Polytechnic Inst., Troy, N. Y.
ADVANCED DEVELOPMENT OF PARTICLE-BEAM-PROBE DIAGNOSTIC SYSTEMS Technical Progress Report, 1 Jul. 1980 - 30 Apr. 1981
R. L. Hickok, W. C. Jennings, J. T. Woo, and K. A. Connor May 1981 93 p
(Contract DE-AS02-76ET-53004)
(DOE/ET-53004/20; RPDL-81-38) Avail: NTIS HC A05/MF A01

Technological improvements made on the ENTOR and ALEX diagnostic systems are reviewed. The effect of the reinstallation of the heavy ion beam probe system on the RENTOR Tokamak is described. Use of the heavy neutral beam probe system on the ALEX baseball facility to measure space potential in minimum-B geometry is evaluated. Data obtained from the TMX beam probe system are discussed. New ion sources and extraction configurations were investigated. Off line processing techniques for beam probe data are evaluated. The development of high energy probing beams and the design of cross over sweep systems are reported. DOE

N81-31982# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Environmental Analysis and Planning Div.
ENVIRONMENTAL ANALYSIS BURIAL OF OFFSITE LOW-LEVEL WASTE AT SRP
W. L. Poe and R. A. Moyer Dec. 1980 86 p refs
(Contract DE-AC09-76SR-00001)
(DPST-80-466) Avail: NTIS HC A05/MF A01

The environmental effects of receipt and burial of low level naval waste are assessed. This low level waste was sent to the NRC-licensed burial ground operated by Chem-Nuclear Systems,

Inc., at Barnwell, South Carolina. The DOE announced that DOE-generated low level waste would no longer be buried at commercial waste burial sites. The SRP was selected to receive the Naval waste described in this analysis. Receipt and burial of these wastes will have a negligible effect on SRP's environment and increase only sightly the environmental effects of the SRP operations discussed in the EIS on SRP waste management operations. The environmental effects of burial of this waste at Chem-Nuclear Burial Ground or at the SRP Burial Ground are described in this environmental analysis to permit assessment of incremental effects caused by the decision to bury this naval waste in the SRP Burial Ground rather than in the Barnwell Burial Ground. The radiological effects from burial of this waste in either the SRP or Chem-Nuclear Burial Ground are very small when compared to those from natural background radiation or to the annual population dose commitment from operaton of SRP. The environmental effects of burial at SRP to dose commitments normally received by the population surrounding SRP are compared. DOE

74 OPTICS

Includes light phenomena.

N81-31983 Arizona Univ., Tucson.
WAVEFRONT ERRORS PRODUCED BY MULTILAYER THINFILM OPTICAL COATINGS Ph.D. Thesis
Robert Edward Knowlden 1981 186 p
Avail: Univ. Microfilms Order No. 8116708

The mirrors used in high energy laser systems have at least two requirements that are uncommon in optical engineering: the reflectance of such mirrors must be very high, and the level of aberrations introduced by the mirrors is desired to be very low. The first requirement can be met by using multilayer thin film coatings, but such coatings can themselves produce aberrations in an optical system. If the errors produced by the coating are to be distinguished from those existing in the test due to misalignment or gravitational flexure of a large mirror, two or more wavelengths must be chosen. There are ambiguities in such a test that may be resolved by choice of an appropriate coating design or by using enough wavelengths in the visible, and both means have been studied. A technique was found where the infrared wavefront can be determined for a coating with proportional thickness errors if the coating prescription is known: interferograms of the mirror are made at three visible wavelengths, and the IR wavefront error due to the coating error is determined in a way that is insensitive to any errors caused by distortion of the substrate or even fairly large misalignments in the optical test of a mirror's figure.
Dissert. Abstr.

N81-31984 Arizona Univ., Tucson.
STRUCTURAL DESIGN OF A LARGE DEFORMABLE PRIMARY MIRROR FOR A SPACE TELESCOPE Ph.D. Thesis
James Gerald Raymond Hansen 1981 183 p
Avail: Univ. Microfilms Order No. 8116704

A 4-meter aperture deformable primary mirror is designed with the mirror and its supports integrated into a single structure. The 2 cm thick, solid ULE mirror is supported by a high modulus graphite epoxy truss structure. The integrated active mirror system is extremely light-weight, making it desirable for a space telescope, as well as for terrestrial applications. Utilizing displacement actuators, the active controls at the mirror's surface include position control and slope control in both the radial and tangential directions at each of the 40 actuator points. Influence functions for each of the controls are nearly independent, reducing the complexity of the control system. Experiments with breadboard models verify the structural concept and the techniques used in the finite element method of computer structural analysis for a system incorporating a solid mirror. The mechanical design of the servo-mechanisms and the flexures to connect the structural members is provided. Dissert. Abstr.

N81-31985 Stanford Univ., Calif.
REMOTE ATMOSPHERIC MEASURMENTS WITH A TUNABLE INFRARED LASER SOURCE Ph.D. Thesis
Martin Joseph Endemann 1981 203 p
Avail: Univ. Microfilms Order No. 8115787

A reliable single ended remote monitoring system operating in the infrared is described. The theory for single ended remote measurements of the concentration of atmospheric trace constituents as well as atmospheric temperature with a tunable laser source is derived. The experimental apparatus is designed to operate in the infrared spectra region. A 1.4 to 4.0 micron tunable optical parametric oscillator is used as transmitter source. A computer control simplifies operation of the system and allows automated measurements. Continuous remote monitoring of atmospheric methane over a 18 hour period demonstrate measurement capabilities of the remote monitoring system. The measured methane concentrations correlate well with data from a local point monitoring station. Simultaneous remote measurements of temperature and humidity using absorption lines of the 1.9 micron water band achieve relative accuracies of 1.5 C and 2% respectively over a 45 sec. averaging period. This measurement demonstrates the application of the tunable infrared monitoring system to metereological measurements. The expected sensitivity for the measurement of other pollutants with absorption lines within the tuning range of the transmitter is discussed.
Dissert. Abstr.

N81-31986 Michigan Univ., Ann Arbor.
ACHROMATIC COHERENT OPTICAL SYSTEMS FOR INFORMATION PROCESSING AND HOLOGRAPHY Ph.D. Thesis
James Arthur Roth 1981 168 p
Avail: Univ. Microfilms Order No. 8116328

The development and analysis optical systems which are coherent, in that they behave linearly in the complex amplitude of the optical fields, yet use a spectrally broad point source of illumination are described. The systems are achromatized at the input, output and filter planes. The systems tend to suppress noise generated in intermediate planes of the optical setup. An achromatic system for performining general linear two-dimensional space-invariant operations and a system capable of recording general holograms of two dimensional objects are presented. The noise performance of these systems is analyzed. The signal-independent three dimensional transfer function is developed. The special case of the signal-dependent transfer function for holography is derived. Simple modification are shown which extend this analysis to the cases of lowpass and high-pass filtering. The achromatic noise point spread function (PSF) is introduced which describes the noise performance from a spatial domain approach. Experiments in image deblurring using the achromatic optical correlator are described, where the input image has been degraded by a linear blur. The problem of practical filter design is considered, and experimentally deblurred slit images are presented. Dissert. Abstr.

N81-31987 Arizona Univ., Tucson.
DESIGN OF A SPACEBORNE LIGHTNING SENSOR Ph.D. Thesis
Michael Nagler 1981 132 p
Avail: Univ. Microfilms Order No. 8115598

The design of BOLTS (Broad Area Lightning Telescope Sensor) is presented. This sensor will provide full time (day/night) coverage of the continental U.S. from a geosynchronous orbit. The requirements, projected performance, and design rationale of the system are presented. The data obtained after frame to frame subtraction is subjected to a threshold test and the resulting positive events are digitized and stored in an on-board digital memory using 48 bits/event. Each record contains intensity information over a dynamic range of 4000, location information and time of occurrence information. A prototype instrument built to perform measurements from aboard a U-2 plane is described. The changes required to expand the design to either a global coverage instrument or a high resolution, smaller field, instrument are described. Dissert. Abstr.

N81-31988 Stanford Univ., Calif.
MEASUREMENT OF INFRARED LASER BACKSCATTER SPECTRA FROM SULFURIC ACID AND AMMONIUM SULFATE AEROSOLS Ph.D. Thesis
Tom Mudd 1981 172 p

Avail: Univ. Microfilms Order No. 8115814

A carbon dioxide laser-based optical system was biult to measure backscatter from aerosols as a function of wavelength. The resulting spectral signatures depend upon the molecular structure within the aerosol particles, and are unique for each aerosol species. A measured signature is compared to a theoretical signature which is computed from knowledge of the complex refractive index for a bulk sample of the aerosol material, the aerosol size distribution, and Mie theory. The refractive index and spectral signature of sulfuric acid aerosols vary with aerosol acid concentration. It was demonstrated that this differential backscatter system can distinguish between different aerosol species and therefore, under experimental conditions, the system could be used to determine the chemical composition of an unknown aerosol. Dissert. Abstr.

N81-31989 Johns Hopkins Univ., Baltimore, Md.
OPTIMAL POINT PROCESS ESTIMATORS FOR GAUSSIAN OPTICAL FIELD INTENSITIES Ph.D. Thesis
Young Chul Park 1981 132 p
Avail: Univ. Microfilms Order No. 8115716

The real and imaginary parts of the analytic signal description of a Gaussian optical field with exponential covariance function evolve as a pair of coupled Gauss-Markov diffusion processes. Application of the Ito differential rule to the sum of the square of these two components yields a stochastic equation of evolution that can be used to obtain a stochastic equation of evolution for the Gaussian optical field intensity itself. This last one dimensional equation is of the form of a Markov diffusion. It was used to obtain a one dimensional equation of evolution for the posterior conditional probability density for the optical field intensity given observations of photoelectron emission times. Numerical solutions to this equation using actual data were used to obtain minimum mean square error (MMSE) estimates of the field intensity as a function of time. In addition, a pair of coupled stochastic equations of evolution for approximately MMSE estimates of the field intensity and its variance were obtained. Numerical solution to these equations using the same data sets as before produced intensity estimates that agreed to within a few percent of the exact MMSE intensity estimates.
Dissert. Abstr.

N81-31990*# Santa Barbara Research Center, Goleta, Calif.
ADVANCED InSb MONOLITHIC CHARGE COUPLED INFRARED IMAGING DEVICES (CCIRID) Final Report
T. L. Koch, R. D. Thom, and W. D. Parrish Sep. 1981 91 p refs
(Contract NAS1-15551)
(NASA-CR-165766) Avail: NTIS HC A05/MF A01 CSCL 20F

The continued development of monolithic InSb charge coupled infrared imaging devices (CCIRIDs) is discussed. The processing sequence and structural design of 20-element linear arrays are discussed. Also, results obtained from radiometric testing of the 20-element arrays using a clamped sample-and-hold output circuit are reported. The design and layout of a next-generation CCIRID chip are discussed. The major devices on this chip are a 20 by 16 time-delay-and-integration (TDI) area array and a 100-element linear imaging array. The development of a process for incorporating an ion implanted S(+) planar channel stop into the CCIRID structure and the development of a thin film transparent photogate are also addressed. The transparent photogates will increase quantum efficiency to greater than 70% across the 2.5 to 5.4 micrometer spectral region in future front-side illuminated CCIRIDs. J.M.S.

N81-31991*# Honeywell Electro-Optics Center, Lexington, Mass.
THERMAL INFRARED ARRAY, PHASE 1. VOLUME 1: TECHNICAL Final Report
26 Mar. 1981 99 p refs
(Contract NAS5-26336)
(NASA-CR-166705; HONEYWELL-8103-07-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 20F

The recommended design configuration for the focal plane array of a 1,000 element linear pushbroom system consists of 32 modules; the complete configuration is built by butting together two 1024 linear arrays. Each of the linear arrays is formed by edge butting 16 modules together. By staggering the modules of the two rows, the channel outages which occur where the modules are edge butted can be eliminated. Two stages TDI operation is performed by the post processing electronics, which reduces the design complexity of the focal plane. Systems studies show that: (1) a single focal plane design can satisfy both the LEO and SEOS mission configurations; (2) available optical designs can meet mission goals; (3) MTF can be traded with optical complexity in a future study; (4) a chopping mechanism can be devised to modifying modulate radiation to a 4-inch focal plane as well as insert two calibration sources at the required frequencies for chopping and calibration; (5) radiative cooling technology should be suitable for a future sensor in either mission configuration; and (6) cold shielding is not a requirement. A.R.H.

N81-31992# Research Inst. of National Defence, Stockholm (Sweden).
DISPLAY PANEL BUILT USING OPTICAL FIBERS AND LIGHT EMITTING DIODES [PRESENTATIONSENHET UPPBYGGD MED LJUSFIBER OCH LYSDIODER]
H. Nygren Sep. 1979 16 p In SWEDISH
(FOA-C-30172-E1) Avail: NTIS HC A02/MF A01

A display panel using a plastic optical conductor and light emitting diodes, with which information gained from infrasonic sound registering equipment is displayed and copied on film by a camera is described. The background of the development of the display unit and an account of equipment construction, electronic activation, and data input are discussed. J.M.S.

N81-31993# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
OPTICS WORKSHOP: VIEW OF THE APPLICATIONS OF THE SPACE OPTICS LABORATORY, AUG. 1979 Final Report
Herbert Oertel and Walter Jaeger Bonn Bundesministerium fuer Forschung und Technologie Dec. 1979 122 p refs In GERMAN; ENGLISH summary Presented at Karlsruhe, West Germany Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-79-44; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,65

After a survey of the optical techniques used in fluid mechanics, a description of the possibilities and of a possible concept of a space optics laboratory is given. This concept is further examined in the light of individual spacelab experiment proposals falling in three main categories: (1) convective transport processes; (2) heat conduction, diffusion and bubbles; and (3) practical applications in material sciences. For individual titles, see N81-31994 through N81-32009.

N81-31994# Institut Franco-Allemand de Recherches, St. Louis (France).
INTRODUCTION TO INTERFEROMETRY [EINFUEHRUNG IN DIE INTERFEROMETRIE]
G. Smeets *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 10-23 refs In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The capabilities of laser interferometry systems are illustrated by means of three examples; optical and electrical lay-outs are discussed together with the optimization of their stability properties. The principles of interferometry are reviewed and the advantages of laser interferometers are identified: high sensitivity; good spatial and temporal resolution; and photoelectric registration. The laser differential interferometer is well suited for boundary layer investigations. The laser interference microphone is a laser version of the Mach-Zehnder interferometer adapted for measuring subsonic fields in nonlinear acoustics and sound radiated from supersonic jets. The laser Doppler anemometer measures Doppler shifts and is well suited for velocity variation measurements.
Author (ESA)

N81-31995# Karlsruhe Univ. (West Germany). Abt. 3 Mechanik Turbulenter Stroemungen.
LASER DOPPLER ANEMOMETRY AND ITS APPLICATION TO FLOW MEASUREMENTS [LASER-DOPPLER-ANEMOMETRIE UND IHRE ANWENDUNG IN DER STROEMUNGSMESSTECHNIK]

Franz Durst *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 24-51 refs In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The physical basis of laser Doppler velocimetry (LDV) is reviewed and its application discussed in support of numerical investigations of turbulent flow fields. Numerical stability and computer capacity are shown to restrict the numerical solution of the Navier-Stokes equations to flows with Reynolds numbers of little practical interest. While the Reynolds equations do not have similar limitations, their use leads, however, to a not closed system of differential equations, the solution of which requires an experimental determination of cross correlation functions by anemometry. Laser Doppler Velocimetry is shown to be superior to hot-wire or hot-film anemometry as a nonperturbing direct measurement of the flow. The theory of LDV is discussed and elucidated by means of Moire interferograms. Practical anemometers are depicted and the supporting electronic systems are described. The advantages of LDV are demonstrated in specific flow applications. Author (ESA)

N81-31996# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
THE SPACE OPTICS LABORATORY [DAS WELTRAUM OPTIKLABOR]
H. Oertel *In its* Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 52-72 refs In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The layout, measuring procedure and data processing for the methods foreseen for the space optics laboratory are described. Lambda/2 compensated differential interferometry, laser differential interferometry, laser Doppler anemometry and laser anemo-interferometry yield local density and velocity distributions in transparent media and can be selected according to the experimental program. All are compatible with space laboratory conditions. The payload configuration, integrated in a Spacelab standard rack, is illustrated. Results of the different methods for applications in chemistry, boundary layer and transport processes are given. Author (ESA)

N81-31997# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
APPLICATION OF THE SPACE OPTICS LABORATORY IN THE SPECIFIC CASE OF BENARD CELL CONVECTION [ANWENDUNG DES OPTIKLABORS AN EINZELBEISPIELEN DER ZELLULARKONVEKTION]
K. Buehler, W. Jaeger, K. R. Kirchartz, and J. Srulijes *In its* Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 73-86 refs In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

A version of the space optics laboratory (SOL), consisting of a lambda/2 compensated differential interferometer and a laser anemo-interferometer was constructed. Its capabilities as a materials science autonomous experiment under zero gravity (MAUS) are assessed. The demonstration of thermal Benard cell convection is considered. The nature of this convection process is recalled and a number of ways under which it occurs under microgravity conditions are discussed: surface-tension; interface-tension induced convection; or acceleration induced convection. Laboratory experiments, simulating such conditions and designed to aid in the understanding and exploitation of the MAUS experiments, are described. They convey a first impression of the variety of applications of SOL and serve as a testbed for extending its concept. Author (ESA)

N81-31998# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Bereich fuer Projekttraegerschaften.
MODES OF OPERATION OF THE SPACE OPTICS LABORATORY [EINSATZ DES OPTIKLABORS]
K. Gardy *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 88-91 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The operation of the space optics laboratory as a fully autonomous experiment (MAUS) or as a Spacelab payload are compared. It is concluded that the effects of acceleration on the planned experiments will not be very different for the two modes of operation. Each experimental module will be tested for vibration and eigenfrequencies. While the optics laboratory should be fully automated when used as a MAUS payload, it is found that only a very restricted number of manipulations by the payload crew should be foreseen for the other mode. The energy autonomy of the MAUS module is thought to allow a wider experimental program. Author (ESA)

N81-31999# Technische Univ., Berlin (West Germany). Inst. fuer Nichtmetallische Werkstoffe-Anorganische Werkstoffe.
INTERFACE CONVECTION UNDER MICROGRAVITY CONDITIONS [GRENZFLAECHENKONVEKTION UNTER MIKROGRAVITATIONSBEDINGUNGEN]
R. Brueckner *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 92-93 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

An experiment is proposed for the study of the instability on an interface under reduced gravity conditions, triggered by the temperature dependence of the interfacial tension. The projected space optics laboratory is predicted to offer enough accuracy in the density and velocity profiles to permit worthwile comparisons with theory. The intervention of the payload crew would allow a detailed parametrical study of the process. Interferograms of supporting laboratory experiments are shown and a schematic of the experimental layout is given.
Author (ESA)

N81-32000# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
FLOW PHENOMENA IN A FLOATING ZONE AND FEASIBILITY OF THEIR INVESTIGATION BY MEANS OF THE SPACE OPTICS LABORATORY [STROEMUNGSVORGAENGE IN FLOATING ZONE UND EINSATZMOEGLICHKEITEN DES OPTIKLABORS]
C. H. Chun *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 94-95 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The possibility of examining heat transport through Marangoni convection under zero gravity conditions by means of the proposed space optics laboratory (SOL) is discussed. This transport process prevails during the growth of monocrystals. A crystal melt was simulated in a supporting laboratory experiment and its results are illustrated. The observed double curvature of the surface of the floating zone is shown to restrict the possible optical methods in SOL to laser differential interferometry and laser Doppler velocimetry and to require a proper treatment of special refraction problems. Author (ESA)

N81-32001# Giessen Univ. (West Germany). Physikalisches Inst.
SPECIAL PROBLEMS ENCOUNTERED IN THE OPTICAL MEASUREMENT OF MARANGONI-CONVECTION FLOW FIELDS [SPEZIELLE PROBLEME DER OPTISCHEN STROEMUNGSMESSTECHNIK BEI DER MARANGONI-KONVEKTION]
A. Scharmann and D. Schwabe *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 96-97 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

Periodic instabilities in the convection pattern of crystal melts were identified in a NaNO3 melt. The experimental setup is described and typical fluctuation recordings are given. The observations point to the coupling between surface instabilities and Marangoni convection. The double curvature of the surface of the floating zone necessitates appropriate optical techniques, such as laser differential interferometry and laser Doppler anemometry. Attention is given to the refraction in the midplane of the droplet. Author (ESA)

N81-32002# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Werkstoffwissenschaften 6.
ORIENTATION EXPERIMENT ON THE CONVECTION IN METAL MELTS [PRINZIPEXPERIMENT ZUR KONVEKTION

IN METALLSCHEMELZEN]
G. Mueller *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 99-100 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

A three-zone oven was built and mounted on a centrifuge to study the transport phenomena in an indium melt under conditions typical for space flight. Stationary and oscillatory convective flows were measured by thermoelements. A stability diagram is derived. Stationary thermal convection is shown to occur when a stable thermal layering in the direction of the centrifugal force field is present. In the case of unstable thermal layering a transition from stationary to oscillatory instabilities is shown to occur in connection with the acceleration magnitude. It is concluded that the physical phenomena leading to oscillatory or stationary convection are not yet fully understood.
Author (ESA)

N81-32003# Karlsruhe Univ. (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
CELL CONVECTION OF REDUCED GRAVITY [ZELLULARKONVEKTION BEI VERMINDERTER GRAVITATION]
K. R. Kirchartz and H. Oertel *In its* Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 101-102 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

Various thermal cellular convection patterns are discussed and illustrated while the conditions for their occurrence are indicated. While stationary convection is mandatory for the production of homogeneous crystals, the space optics laboratory is shown to be suited for studying how stable configurations are perturbed by typical space flight conditions. The importance of investigating the instabilities of rotating systems decoupled from gravity and of the expected enhancement of instability at low Prandtl numbers under reduced gravity is stressed. Applications of cell convection experiments in geophysics and astrophysics are listed.
Author (ESA)

N81-32004# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Theoretische Stroemungsmechanik.
INFLUENCE OF TRANSVERSE MAGNETIC FIELDS [EINFLUSS TRANSVERSALER MAGNETFELDER]
G. S. R. Sarma *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 103-104 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The stabilization of Marangoni convection in crystal melts by rotation or by transverse magnetic fields is theoretically studied. The resulting stability diagrams show an increase of the critical Marangoni number with increasing Taylor and Chandrasekhar numbers irrespective of the boundary conditions. Explanations for this dependence are offered. The usage of the space optics laboratory for testing and optimization of stable convection conditions is advocated.
Author (ESA)

N81-32005# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Raumsimulation.
SPACE EXPERIMENTS ON DISSIPATIVE STRUCTURES [RAUMEXPERIMENTE ZU DISSIPATIVEN STRUKTUREN]
A. Bewersdorff *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 107-108 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

A proposal is studied to include a spectrometer in the space optics laboratory (SOL) in order to study a possible influence of gravity on the instability of reacting systems; i.e., on dissipative structures. Such structures pertain to nonequilibrium thermodynamics and are important in biology and biochemistry. Examples of dissipative structures are given. It is shown that the period of time dependent structures increases with the velocity gradients of a shear flow. The addition of a spectrometer to the SOL payload allows for separating the individual components of the system.
Author (ESA)

N81-32006# Metallkundelabor an der Fachhochschule, Kiel (West Germany).
MEASUREMENT OF THE BOUNDARY LAYER ADHERENT TO THE ELECTRODES OF AN ELECTROLYTIC CELL [MESSUNG DER ADHAERIERTEN GRENZSCHICHT AN DEN ELEKTRODEN EINER GALVANISCHEN ZELLE]
G. Mix *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 112-113 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

The thickness of the boundary layer adhering to battery electrodes is measured. The width of this layer determines the reaction rate of electrode corrosion as well as the electrode potential. The electrochemical basis of these processes is recalled. While on Earth, gravity-driven convection limits the thickness from 0.001 cm to 0.05 cm. It is predicted that, in the absence of gravity, the total electrolyte volume behaves like an adhering layer, resulting in a strong enhancement of the electrochemical effects. Shuttle maneuvering and g-jitter are mentioned as likely sources of interference. The thickness can only be measured by optical means and the space optics laboratory is considered to be adequately equipped.
Author (ESA)

N81-32007# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STORAGE OF FLUIDS AND FUELS IN LARGE TANKS UNDER ZERO GRAVITY [LAGERUNG VON FLUESSINGKEITEN UND TREIBSTOFFEN UNTER NULL-g-BEDINGUNGEN IM GROSSEN TANK]
G. Netter *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 114-115 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

Spacelab tests of various tank configurations are proposed in order to dispense with the membranes used in the present versions. These membranes, separating fuel and driver gas, age quickly. The proposed containers are compartmentalized in such a way that, exploiting surface tension, the fuel is delivered free of bubbles. Bubble traps are incorporated in order to achieve bubblefree operation under all acceleration conditions. In view of the construction of a dynamical model of the entire spacecraft, the proposal foresees a motion simulator consisting of spheres or cylinders.
Author (ESA)

N81-32008# Freiburg Univ. (West Germany). Kristallographisches Inst.
GROWTH OF SILICON CRYSTALS [ZUECHTUNG VON SILIZIUMKRISTALLEN]
M. Leiste *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 116-117 refs In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

Three methods for crystal growth are proposed as a Spacelab experiment: (1) sublimation from CdTe; (2) through chemical gas transport with ZnS and iodine; (3) silicon growth by means of the floating zone method. A mirror oven, which is the heating source for the three methods, and capable of achieving temperatures up to 2300 C using 800 W, is described. The mechanisms of crystal growth out of germ and matrix materials are reviewed. The instrumentation of the space optics laboratory is shown to be adequate for measuring the transport processes of the two methods involving gaseous phases. In the case of melts, holographic interferometry is proposed to monitor the evolving surface configurations. The restricted energy available in Spacelab is, however, thought to exclude this diagnostic.
Author (ESA)

N81-32009# Freiburg Univ. (West Germany). Chemisches Lab.
PROTEIN CRYSTAL GROWTH UNDER SPACE CONDITIONS [KRISTALLWACHSTUM VON PROTEINEN UNTER WELTRAUMBEDINGUNGEN]
W. Littke *In* Karlsruhe Univ. Opt. Workshop: View of the Appl. of the Space Opt. Lab. Dec. 1979 p 118-119 In GERMAN (For primary document see N81-31993 22-74)
Avail: NTIS HC A06/MF A01

Spacelab experiments on the monocrystal growth of Lyzozyme and beta-Galactosidase are proposed and discussed. Large monocrystals of proteins are indicated to be essential for diagnostics by X-ray or neutron scattering from which the

biochemical relationship between structure and function can be inferred. Since gravity-induced convection stimulates germ formation, zero gravity conditions are advocated as essential for the manufacturing of large crystals. The lay-out of the proposed crystallization chamber is given including a thermostat, cells for salts and buffer solutions, and a rotation gear. Author (ESA)

N81-32010# Fondazione Ugo Bordoni, Rome (Italy).
MODAL NOISE IN OPTICAL FIBERS AND SIGNAL FLUCTUATIONS IN AN UNDERGROUND LAID OPTICAL CABLE
Giancarlo DeMarchis, Salvatore Piazzolla, and Benedetto Daino Sep. 1980 8 p refs Presented at 6th European Conf. on Optical Communication, York, United Kingdom, Sep. 1980
(FUB-44-1980) Avail: NTIS HC A02/MF A01

The theory of modal noise in multimode transmission by optical fibers is developed and an expression for the adjustment of calculated signal to noise ratios in the case of mode coupling is given. Measurements made on an installed optical fiber cable are reported and a statistical analysis of power output is presented. For individual titles, see N81-32011 through N81-32012.

N81-32011# Fondazione Ugo Bordoni, Rome (Italy).
MODAL NOISE IN OPTICAL FIBERS
Giancarlo DeMarchis, Salvatoro Piazzolla, and Benedetto Daino *In its* Modal Noise in Optical Fibers and Signal Fluctuations in an Underground Laid Optical Cable Sep. 1980 p 1-4 refs
(For primary document see N81-32010 22-74)
Avail: NTIS HC A02/MF A01

The theory of modal noise in multimode transmission by optical fibers is developed. The statistical properties of the power crossing a given area of fiber section are analyzed. The relative phases of the modes are considered to be independent and randomly distributed. Fluctuation of mode amplitudes independently of their phases is hypothesized. The coherence function, the joint statistics of the intensity and the variance of the total power crossing the given section are obtained. The experimental signal to noise ratio in some cases is shown to be higher than the theoretical value. An expression for the correlated variance is given, permitting the adjustment of the signal to noise ratio calculations for the case of fibers presenting mode coupling. Author (ESA)

N81-32012# Fondazione Ugo Bordoni, Rome (Italy).
SIGNAL FLUCTUATIONS IN AN UNDERGROUND LAID OPTICAL CABLE
Salvatoro Piazzolla, Giancalo DeMarchis, and Benedetto Daino *In its* Modal Noise in Optical Fibers and Signal Fluctuations in an Underground Laid Optical Cable Feb. 1980 p 5-7 refs
(For primary document see N81-32010 22-74)
Avail: NTIS HC A02/MF A01

Measurements made on an installed optical fiber cable are reported. A He-Ne laser was used as a source. The output optical power crossing all the core or a part of it smaller than the correlation area of the speckle pattern are shown. The relative theoretical probability density function of the total signal and the autocorrelation function of the noise obtained when detecting the optical power from the smaller areas are also presented for various lengths. The relative correlation times are shown to correspond to frequencies of 0.01 Hz, suggesting the existence of thermal effects. Author (ESA)

N81-32013# Mission Research Corp., Santa Barbara, Calif.
REQUIREMENTS FOR IMPROVED INFRARED PREDICTION CAPABILITY: LWIR Final Report, 31 Oct. 1979 - 31 Oct. 1980
Douglas H. Archer 31 Oct. 1980 128 p refs
(Contract DNA001-79-C-0116; DNA Proj. S99-QAXH1004-30)
(AD-A102523; MRC-R-583) Avail: NTIS HC A07/MF A01 CSCL 17/5

This report describes work performed to determine the major uncertainties involved in the prediction of the long wavelength infrared (LWIR) environment following a megaton-class, high-altitude burst. Included for consideration is emission from the molecular species O3, NO2, N2O, CO2, uranium- and fission-fragment oxide ions, and from electrons in the fireball plume. A priority listing is provided of recommended research items necessary for improvement of our prediction capability.
Author (GRA)

N81-32014# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ANALYSIS OF AN ELECTRO-OPTICAL SATELLITE OBSERVATION
Gerard J. Mayer 4 Jun. 1981 40 p refs
(Contract F19628-80-C-0002; AF Proj. 3221; AF Proj. 2698)
(AD-A102514; ETS-59; ESD-TR-81-172) Avail: NTIS HC A03/MF A01 CSCL 14/5

A satellite has been observed through an optical telescope with a CCD camera, the electrical signal stored, and later analyzed with the aid of a digital computer. The unresolved satellite image is contained in 3 to 7 picture elements in fifty contiguous data frames. This allows a better understanding of the physical characteristics of the satellite image as viewed through the atmosphere by an electro-optical detector. This paper describes the data processing programs used to analyze the data, the analysis results, and implications for signal processing design.
Author (GRA)

N81-32015# TRW, Inc., Philadelphia, Pa. Electronics Components Group.
OPTICAL FIBER COMMUNICATIONS CABLE CONNECTOR Final Report, 1 May 1979 - 17 Feb. 1981
John G. Woods Jul. 1981 71 p refs
(Contract DAAK80-79-C-0772; DA Proj. 1L1-62701-AH-92)
(AD-A102508; CORADCOM-79-0772-F) Avail: NTIS HC A04/MF A01 CSCL 20/6

A six channel hermaphroditic connector, which will function with 125 micron to 150 micron diameter optical fibers, was designed, constructed, and tested. The principal aspects of design, including the incorporation of the TRW Cinch Optalign 'double elbow' fiber alignment guide concept are included. Means for connecting either Siecor or ITT six fiber cable were developed. The use of ITT cable required the development of methods for stripping the jacket and buffer layer from each fiber, and applying a protective trimethylchlorosilane coating to retain inherent glass fiber strength. The rapid and simple connector assembly procedures for the final model are described, as well as the unique fiber scribe and cleave tool which was designed specifically for use with this connector. Typical insertion loss levels obtained with the ITT cable are approximately 1.0 dB, seldom greater than 1.5 dB. The results of vibration, thermal shock and mating durability tests are discussed. GRA

N81-32016# Science Applications, Inc., La Jolla, Calif.
THE ROSCOE MANUAL. VOLUME 27: NATURAL BACKGROUND RADIATION Final Report, 1 Jan. 1976 - 30 Jun. 1979
Daniel A. Hamlin and Melvin R. Schoonover 1 Jul. 1980 344 p refs
(Contract DNA001-76-C-0194)
(AD-A102524; SAI-78-604-LJ-6; DNA-3964F-27) Avail: NTIS HC A15/MF A01 CSCL 20/6

The Natural Background Radiation Module computes the Earth's natural upwelling spectral radiance (from 2 to 5 micrometers) by averaging over paths in an Earth-tangent cone with vertex at each selected altitude. The processes contributing to the radiance are emission from air, Earth's surface, and clouds and reflection of solar radiation from Earth's surface and clouds; attenuation is by molecules and aerosols. The Module integrates ROSCOE-IR models for atmosphere, atmospheric thermal emission, molecular transmittance, aerosols, clouds, Earth's surface characterization and radiance, solar radiation, and upwelling natural radiation. The last 3 models are documented fully; other models (three of which were developed by other organizations) are documented mainly in terms of functions performed, inputs, and outputs. The user selects the modeled Earth's surface from one of seven categories (with possibly an associated descriptor): Lambertian surface (and diffuse reflectance), wind-ruffled water (and wind speed), snow (and its age parameter), sand, soil, foliage, and urban material (and degree-of-urbanization parameter). Author (GRA)

N81-32017# Sandia Labs., Albuquerque, N. Mex.
TEMPORAL DECAY OF THE OPTICALLY INDUCED PROPERTIES OF A SMALL-POLARONIC SOLID

David Emin 1981 15 p refs Presented at the 9th Intern. Conf. on Amorphous, Grenoble, France, 2 Jul. 1981
(Contract DE-AC04-76DP-00789)
(SAND-81-1268C; CONF-810719-1) Avail: NTIS HC A02/MF A01

The essential physics of the photoluminescence of a small-polaronic solid (one in which electrons, holes and excitons all find it energetically favorable to self-trap) is described. Emphasis is placed on the dependence of the decay rates associated with the various luminescence bands on excitation energy and temperature. The results are in general accord with observations on chalcogenide glasses. DOE

N81-32018# Los Alamos Scientific Lab., N. Mex. Mechanical Fabrication Div.
ULTRAPRECISION MACHINING OF OPTICS AT LOS ALAMOS
R. L. Rhorer, A. L. Gauler, E. W. Colston, and J. R. Ruhe 1981 9 p refs Presented at the Intern. Symp. of the Soc. of Photo-Optical Instrumentation Engr., San Diego, Calif., 24-28 Aug. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1962) Avail: NTIS HC A02/MF A01

Ultraprecision machine tools used for single point diamond turning of optics and other precision parts are considered. Measurements of a 50 mm dia copper flat are used to illustrate the quality of a part which can be machined on the Moore No. 3 lathe. Measurements of a 0.4 m dia aluminum mirror with a 20 m radius of curvature are presented as an example of a part machined on the Moore No. 5 lathe. A varying frequency sine wave grating is used to show a type of special optical grating which can be produced using the Pneumo lathe. DOE

N81-32019# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
APPLICATIONS OF PERIODIC INTEGRATED OPTICAL STRUCTURES IN COMMUNICATION CIRCUITS
R. Zengerle Jan. 1980 63 p refs In GERMAN; ENGLISH summary
(Rept-465-TBr-20.) Avail: NTIS HC A04/MF A01

The application of periodic structures as integrated optical or micro-optical circuits in signal transmission and signal processing is reviewed critically. Difficulties of implementation are also indicated. Narrow-band optical emitters, modulators and switches, multiplex structures, and filters are discussed. Multiplex structures used for better utilization of transmission capacity of fibers and filters are found especially attractive. The coupling between fibers and integrated optical structures by means of transversal, horizontal or grid coupling is treated. In view of the complexity of the technology an economical application is thought to be possible only if mass preduction can be achieved.
Author (ESA)

N81-32020# National Maritime Inst., Teddington (England).
THE APPLICATION OF OPTICAL FIBERS FOR MONITORING DEVICES FOR THE DETECTION OF PLASTIC STRAIN AND CRACKING
K. F. Hale, B. S. Hockenhull (Cranfield Inst. of Technolology), and G. Christodoulou (Cranfield Inst. of Technolology) Jan. 1980 19 p
(NMI-R-72; OT-R-8006) Avail: NTIS HC A02/MF A01

An inexpensive method of structural integrity monitoring of structures made from a wide variety of materials based on the fracture of optical fibers attached by appropriate adhesives is described. Experiments using two different chemical etching solutions in which the fiber strain to fracture is controlled to 0.5% were carried out. The technique is especially useful for monitoring crack initiation and growth and unacceptable amounts of plastic strain in normally inaccessible parts of a structure. Monitoring can be carried out during periodic inspection or it can be performed continuously and remotely. Author (ESA)

N81-32021# Royal Signals and Radar Establishment, Malvern (England).
THE PROTECTION OF FRONT SURFACED ALUMINUM MIRRORS WITH DIAMOND-LIKE CARBON COATINGS FOR USE IN THE INFRARED
A. H. Lettington and G. J. Ball Jan. 1981 11 p refs
(RSRE-Memo-3295; BR77777) Avail: NTIS HC A02/MF A01

The use of an infrared transmitting diamond-like carbon coating for metallic reflectors to correct for reflectivity losses in the 8 to 12 micron band is proposed. Many thin passivation layers have severe reflectivity losses when used at oblique incidence. Measurements and calculations illustrating this effect are presented. The destructive interference appears at angles lower than a limit related to the refractive index and the extinction coefficient. An expression for that limit is given. Carbon overcoating of metallic reflectors is shown to upgrade the reflectivity in the 8 to 12 micron band, at angles of incidence of 45 and 60 deg. Applications such as catadioptric telescopes permanently exposed to the atmosphere can be envisaged using this technique.
Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N81-32022 Michigan Univ., Ann Arbor.
LASER HEATING OF ALUMINUM EXPLODING WIRE PLASMAS Ph.D. Thesis
Don Raymond Kania 1981 196 p
Avail: Univ. Microfilms Order No. 8116264

The X-ray emissions and dynamical behavior of exploded aluminum wire plasmas was examined in the presence of intense CO2 laser radiation. The laser system is based on a Lumonics 601 TEA laser. It was optimized to produce a diffraction limited spot, diameter of 125 microns, yielding a focused intensity of 10 12 W/sq. cm. The principal X-ray diagnostics consisted of a two foil temperature measurement using filtered photomultiplier detectors and an X-ray pinhole camera. These measurements were augmented by a variety of electrical and optical diagnostics to determine the time evolution of the effects of laser irradiation. Interaction experiments were performed with a radial, one sided illumination at the plasma midplane. Dissert. Abstr.

N81-32023 Maryland Univ., College Park.
MACROSCOPIC PLASMA BEHAVIOR IN A HIGH VOLTAGE TOROIDAL THETA PINCH Ph.D. Thesis
Donald Paul Murphy 1980 172 p
Avail: Univ. Microfilms Order No. 8117357

The behavior of the implosion and post-implosion phases of two different high beta plasma conditions was investigated. The two plasma cases differed from each other by the direction of their initial toroidal magnetic field relative to the direction of the main implosion magnetic field. The factors governing the development and lifetime of the configuration during the post-implosion phase were investigated. It was determined from the q profiles that the plasma was unstable to the m = 1 kink mode but the normal outward drift of the plasma carried it into the vacuum chamber wall before the kink mode could grow to a significant level. Thus, efforts to lengthen the plasma lifetime by slowing the outward drift would be thwarted by the onset of the kink mode. It was also found that the magnetic fields in the case with the initial toroidal field antiparalllel to the main implosion magnetic field exhibited strong nonaxisymmetric behavior. There was some indication that this behavior might be due to reconnection of the field lines from the compressed initial toroidal field to the oppositely directed main implosion field. Dissert. Abstr.

N81-32024 Michigan Univ., Ann Arbor.
NANOSECOND CO2 LASER INTERACTION WITH A DENSE HELIUM Z-PINCH PLASMA Ph.D. Thesis
David Frederick Voss 1981 180 p
Avail: Univ. Microfilms Order No. 8116352

A short pulse CO2 laser system was constructed to investigate the interaction of intense electromagnetic radiation with dense plasma. The laser was focused perpendicular to the axis of a linear helium Z-pinch plasma and properties of the transmitted beam were monitored. Transmitted beam intensity and spatial distribution were measured as functions of incident intensity and

interaction time. The results of the experiments with the overdense plasma were found to be consistent with plasma hydrodynamic theory. A 40 nanosecond pulse was sufficiently long to burn through the plasma, but a 4 nanosecond pulse was not. The 4 nanosecond pulse was long enough to form a local density depression in the underdense plasma and density gradients steep enough to produce Fresnel diffraction, despite the absence of a critical surface. The resultant change in refractive index could cause thermal self-focusing. The transmission measurement was not found to be consistent with a simple model of inverse bremsstrahlung absorption. At an intensity of 10 to the 12th power W/cu/cm there was a sharp decrease in transmission. This suggests the possibility of either increased absorption due to enhanced ionization or increased reflection due to simulated Brillouin backscatter. Dissert. Abstr.

N81-32025 Michigan Univ., Ann Arbor.
ON SOLITARY KINETIC ALFVEN WAVES IN A MAGNETIZED PLASMA Ph.D. Thesis
James Patrick Sheerin 1981 130 p
Avail: Univ. Microfilms Order No. 8116336

It is proposed that an external magnetic field may inhibit instabilities of multidimensional solitary waves in plasmas. The solitary kinetic Alfven wave (KAW) is investigated in one, and more than one dimension. Nonlinear terms in the wave equation are retained to all orders in the amplitude consistent with the assumption that the plasma pressure is much less than the magnetic pressure. In a cylindrically symmetric geometry, the wave is self-localized in the radial direction (i.e., transverse to the ambient magnetic field line). The radial profile of the wave steepens with the increasing strength of the nonlinearity. The wave steepening saturates at a finite radius. A Lyapunov method is developed to study the stability properties of the non-integrable system. It is found that the cylindrically symmetric solitary KAW is stable against perturbations which do not break its symmetry. The nonlinear waveguide is unstable to transverse perturbations which do reduce its symmetry. Dissert. Abstr.

N81-32026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH B-FIELD, LARGE AREA RATIO MHD DUCT EXPERIMENTS
J. Marlin Smith, Shih-Ying Wang, and J. L. Morgan 1981 14 p refs Presented at the Intern. Conf. on Plasma Sci., Santa Fe, N. Mex. 18-20 May 1981; Sponsored by IEEE
(Contract DE-AI01-77ET-10769)
(NASA-TM-82673; E-956; DOE/NASA/10769-10) Avail: NTIS HC A02/MF A01 CSCL 20I

Studies of the effect of area ratio variation on the performance of a supersonic Hall MHD duct were extended up to area ratios of 6.25/1. It is shown that for a given area ratio there is a combustion pressure above which the power generating region of the duct is shock free and the power output increases linearly with the square of the magnetic field. Below this pressure a shock forms in the duct which moves upstream with increasing magnetic field strength and results in a less rapid rise in power output. Author

N81-32027# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
NEGATIVE ION/MOLECULE REACTIONS IN A NEGATIVE CORONA DISCHARGE
Victor Kotasek Apr. 1981 63 p refs
(UTIAS-TN-230; ISSN-0082-5263) Avail: NTIS HC A04/MF A01

An atmospheric pressure negative corona discharge (point to plane) coupled to a quadrupole mass spectrometer was used to study negative ion/molecular chemistry. It was shown that neutral intermediates, mainly 03, N02 and N0, are produced by high energy electron dissociation of air constituents in a very narrow volume close to the point electrode. The neutrals are transported by air flow or diffuse into the discharge gap and undergo ion/molecule reaction initiated by the 02-and 0-ion. A tentative ion/molecular reaction scheme was proposed. Furthermore a reduction of the negative ions N02, N03, C03 and 03 to less than 1% was possible in zero air by flowing a nonelectronegative gas around the point electrodes. In room air the negative ions N03, 03 and C03 were reduced by approximately 95%. The N02 ion increases indicating it is present in room air. M.G.

N81-32028# Nagoya Univ. (Japan). Inst. of Plasma Physics.
FIELD REVERSAL BY ROTATING WAVES
N. J. Fisch (Princeton Univ.) and T. Watanable (Hiroshima Univ., Japan) Jun. 1981 18 p refs
(IPPJ-526) Avail: NTIS HC A02/MF A01

Rotating waves are suggested as a means of generating currents that, in turn, produce a compact torus configuration. The practicality of this scheme is assessed with regard to stability and power requirements. The method of rating current is compared to other methods of nonohmic current drive. Author

N81-32029# Los Alamos Scientific Lab., N. Mex.
POSITION DIAGNOSTICS FOR A MAGNETIC-PINCH IMPLODING-CYLINDER X-RAY GENERATOR
J. D. Seagrave, C. W. Woods, and L. A. Jones 1981 6 p refs Presented at Conf. on Optics, Santa Fe, N. Mex., 6 Apr. 1981 Submitted for publication
(Contract W-7405-eng-36)
(LA-UR-81-1442; CONF-810429-32) Avail: NTIS HC A02/MF A01

For the diagnostic instrumentation of an imploding cylindrical plasma intended as a prototype for a high-intensity flash X-ray source, two systems were developed which employ batteries of inexpensive 1.2-ns (FWHM) nitrogen lasers fired in sequence during the approx. 2-microsec period of the implosion. Four pinhole-schlieren paraxial photographs are taken, and eight radial profiles are obtained using a novel position-sensitive detector based on a fluorescent plastic-fiber optical delay line. DOE

N81-32030# Illinois Univ., Urbana. Fusion Studies Lab.
CONFINEMENT REQUIREMENTS FOR OHMIC-COMPRESSIVE IGNITION OF A SPHEROMAK PLASMA
R. E. Olson and G. H. Miley 1981 5 p refs Presented at the Am. Nucl. Soc. Ann. Meeting, Miami Beach, Fla., 7 Jun. 1981
(Contract DE-AS02-76ET-52040)
(CONF-810606-33; COO-2218-204) Avail: NTIS HC A02/MF A01

The Moving Plasmoid Reactor (MPR) is an attractive alternative magnetic fusion scheme in which Spheromak plasmoids are envisioned to be formed, compressed, burned, and expanded as the plasmoids translate through a series of linear reactor modules. Although auxiliary heating of the plasmoids may be possible, the MPR scenario would be especially interesting if ohmic decay and compression alone is sufficient to heat the plasmoids to an ignition temperature. In the present work, the transport conditions under which a Spheromak plasmoid can be expected to reach ignition via a combination of ohmic and compression heating was examined. DOE

N81-32031# Illinois Univ., Urbana. Fusion Studies Lab.
PLASMA ION HEATING AND ENERGY LOSS FROM ALPHA-PARTICLE MICRO- INSTABILITIES
W. R. Sutton, K. C. Choi, and G. H. Miley 1981 6 p refs
(Contract DE-AS02-76ET-52040)
(CONF-810606-34; COO-2218-203) Avail: NTIS HC A02/MF A01

An engineering model is described which scopes the effect of a velocity space relaxation of fast alphas on a quasi-linear time scale. An approximation for the ion heating is given. DOE

N81-32032# Princeton Univ., N. J. Plasma Physics Lab.
BANANA DRIFT TRANSPORT IN TOKAMAKS WITH RIPPLE
R. Linsker and A. H. Boozer Apr. 1981 24 p refs
(Contract DE-AM02-76CH-03073)
(PPPL-1784) Avail: NTIS HC A02/MF A01

Ripple transport in Tokamaks is discussed for the banana drift collisionality regime, which lies below the ripple plateau regime. The physical mechanisms that dominate banana drift transport are found to differ from those considered in previous work on this regime, and the resulting transport coefficients can consequently differ by several orders of magnitude. DOE

N81-32033# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF A 600 KV MARX MODULE FOR A HIGH-DENSITY Z-PINCH EXPERIMENT
Ralph W. Kewish, Jr. 1981 11 p refs Presented at the 3rd IEEE Intern. Pulsed Power Conf., Albuquerque, N. Mex., 1-3 Jun. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1584; CONF-810659-6) Avail: NTIS HC A02/MF A01

A 600 kV Marx generator was designed with a self-inductance of 1.4 micro H. Two generators in parallel form a module with a self-inductance of 700 nH. Initial operation will be with twelve 0.2 micro f capacitors giving 12 kJ of stored energy and capable of a short circuit of 125 kA. These capacitors may be exchanged for 0.43 micro f units to double the stored energy and current capability. Criteria for switch operating conditions with the working gas, air, and operating pressure were achieved. DOE

N81-32034# Princeton Univ., N. J. Plasma Physics Lab.
MODULAR COILS: A PROMISING TOROIDAL-REACTOR-COIL SYSTEM
T. K. Chu, H. P. Furth, J. L. Johnson, C. Ludescher, and K. E. Weimer Apr. 1981 30 p refs
(Contract DE-AM02-76CH-03073)
(PPPL-1796) Avail: NTIS HC A03/MF A01

The concept of modular coils originated from a need to find reactor-relevant stellarator windings, but its usefulness can be extended to provide an externally applied, additional rotational transform in Tokamaks. Considerations of (1) basic principles of modular coils, (2) types of coils, (3) types of configurations (general, helically symmetric, helically asymmetric, with magnetic well, with magnetic hill), (4) types of rotational transform profile, and (5) structure and origin of ripples are given. These results show that modular coils can offer a wide range of vacuum magnetic field configurations, some of which cannot be obtained with the classical stellarator or torsatron coil configuration. DOE

N81-32035# Stanford Linear Accelerator Center, Calif.
STATUS OF THE US HEAVY ION FUSION PROGRAM
W. B. Herrmannsfeldt Apr. 1981 20 p refs Presented at the Workshop on the Application of the SNS to Heavy Ion Fusion, Abingdon, England, 23-26 Mar. 1981
(Contract DE-AC03-76SF-00515)
(SLAC-Pub-2722; CONF-810375-1) Avail: NTIS HC A02/MF A01

The US heavy ion fusion (HIF) program is reviewed. The political situation is discussed and then the technical justification for the interest in HIF is presented. This is followed by a brief description of the Argonne Program to develop the rf linac storage ring system for which the spallatron neutron source can contribute important data. The direction being taken by the Berkeley group to develop the inducation linac system is described. DOE

N81-32036# California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF THE EQUILIBRIUM AND DECAY OF COMPACT TOROIDS GENERATED BY A MAGNETIZED CO-AXIAL PLASMA GUN
E. H. A. Granneman (Fom-Inst. voor Atoom-en Molecuulfysica, Amsterdam), G. C. Goldenbaum (Maryland Univ., College Park), J. H. Hammer, C. W. Hartman, D. S. Prono, J. Taska, and W. C. Turner 27 Apr. 1981 10 p refs Presented at the 10th European Conf. on Controlled Fusion and Plasma Phys., Moscow, 14-19 sep. 1981 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-85912; CONF-810906-4) Avail: NTIS HC A02/MF A01

The co-axial gun production of compact toroidal plasmas that are contained in an oblate shaped cylindrically symmetrical flux conserver is discussed. The magnetic structure produced by the gun is well described by force-free current. The analysis of the data is extended along the lines of Taylor's theory of the reversed field pinch. Spatial magnetic field profiles are well represented by the lowest energy eigenmode solution to nabla x vector B = k vector B with k = constant. DOE

N81-32037# Los Alamos Scientific Lab., N. Mex.
PARALLEL-BEAM CORRELATION TECHNIQUE FOR MEASURING DENSITY FLUCTUATIONS IN PLASMAS WITH STRONG MAGNETIC SHEAR
A. R. Jacobson Apr. 1981 16 p refs
(Contract W-7405-eng-36)
(LA-8828-MS) Avail: NTIS HC A02/MF A01

A laser diagnostic scheme is described which facilitates localization of density fluctuations along the line of sight. The method exploits both the generally observed anisotropy of density fluctuations in low-beta plasmas, as well as the twisting of the magnetic field which occurs across the minor diameter of reversed-field pinches and spheromaks. Both interferometric and Schlieren variations are discussed. DOE

N81-32038# Sandia Labs., Albuquerque, N. Mex.
PARTICLE BEAM FUSION Progress Report, Jan. - Jun. 1980
May 1981 180 p refs
(Contract DE-AC04-76DP-00789)
(SAND-80-2500) Avail: NTIS HC A09/MF A01

An overview and technical summaries are given for research progress in each of the following general areas: (1) fusion target studies: (2) target experiments; (3) particle beam source theory; (4) diagnostics development; (5) particle beam experiments; (6) pulsed power research and development; (7) pulse power application; and (8) electron beam fusion accelerator project. DOE

N81-32039# Oak Ridge National Lab., Tenn.
STATUS OF THE TOKAMAK PROGRAM
J. Sheffield Jun. 1981 140 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7778) Avail: NTIS HC A07/MF A01

During the past two decades, the Tokamak program has made significant advances. As a result of these advances, the program has expanded, and construction is nearly completed of large facilities, including the US Tokamak Fusion Test Reactor (TFTR), that are capable of achieving energy break even in the plasma. Design work is under way on the next application phase, exemplified by the US Fusion Engineering Device (FED) and the IAZA INTOR programs. The status of the Tokamak program is reviewed concentrating on recent advances and areas important to the further advancement of the Tokamak concept. DOE

N81-32040# Science Applications, Inc., La Jolla, Calif. Lab. for Applied Plasma Studies.
SIMPLE FAST ROUTINE FOR COMPUTATION OF ENERGY TRANSPORT BY SYNCHROTON RADIATION IN TOKAMAKS AND SIMILAR GEOMETRIES
S. Tamor Jun. 1981 29 p refs
(Contract DE-AC03-81ER-53113)
(SAI-023-81-189-LJ; LAPS-72) Avail: NTIS HC A03/MF A01

Calculation of energy transport by synchrotron radiation has long been considered as a difficult computational problem, largely due to the nonlocal nature of the transport which is aggravated by the presence of reflecting walls. A simple physical model is presented which mimics the main features of the transport. A computer code based upon this model is described and test calculations comparing its results to predictions of a full transport calculation are presented. Satisfactory agreement is found, both for the total energy loss and the radial profile of the power density. DOE

N81-32041# Science Applications, Inc., La Jolla, Calif. Lab. for Applied Plasma Studies.
PROFILE EFFECTS OF SYNCHROTRON RADIATION IN DEUTERIUM-FUELED TOKAMAKS
D. C. Baxter and S. Tamor Jul. 1981 15 p refs
(Contract DE-AC03-81ER-53113)
(SAI-023-81-215-LJ) Avail: NTIS HC A02/MF A01

Calculations of temperature profile of D-fueled Tokamaks using the standard point models for synchrotron radiation and a transport model are compared. It is shown that transport of radiation has a significant effect on the temperature profile, and that the sensitivity of the profile shape to the set transport loss is comparable to that for thermal conduction. DOE

N81-32042# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
REPORTS FROM THE DEPARTMENTS OF ELECTRON AND PLASMA PHYSICS: INDEX AND ABSTRACTS, 1980
Feb. 1981 34 p refs
(TRITA-EPP-80-13; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

Titles and abstracts are listed for a series of preprints, internal reports and journal articles. Electron physics, plasma physics and nuclear fusion topics are emphasized. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N81-32043 Rice Univ., Houston, Tex.
CRITICAL DYNAMICS OF LIQUID CRYSTAL ABOVE THE ISOTROPIC-NEMATIC PHASE TRANSITION Ph.D. Thesis
Fang-Yu Chen 1981 69 p
Avail: Univ. Microfilms Order No. 8116944

Dynamics of liquid crystals above the isotropic nematic phase transition point is studied. The phase transition is of first order, but nearly critical. Near the transition point the correlation length zeta of molecular orientational order could be comparable to the inverse of a light scattering momentum transfer k. The nonlinear effects in the dynamics of molecular orientation under such a condition are studied. The complete quadratic dynamic equations for molecular orientation and translational velocity, based on Mori's theory of the generalized Langevin equation are derived. A mode coupling method equivalent to the bubble diagram expansion is applied to solve the nonlinear equations. The lowest order calculation shows that the effect of nonlinear couplings becomes significant when zeta is comparable to 1/k. The effect on the polarized and depolarized spectrum of light scattering is discussed. It is shown that that if nonlinear couplings do dominant the critical relaxations one would obtain a resul contradictory to the assumption. Thus, in the isotropic-nematic transition region mode-mode couplings can not be the dominant mechanism of relaxations. Dissert. Abstr.

N81-32044 Stanford Univ., Calif.
LAYERED SUPERCONDUCTING COMPOSITES Ph.D. Thesis
Steven Thomas Ruggiero 1981 169 p
Avail: Univ. Microfilms Order No. 8115827

Finely layered Niobium/Germanium composites with unique physical and superconducting properties are discussed. These materials are studied as model systems for quasi-two dimensional superconductors and have provided quantitative verification of dimensional crossover behavior in complete agreement with the Josephson-coupling theory. The composites consist of alternating sputter-deposited thin films of Nb and Ge. Individual layer thickness ranges from 5 A t 100 A; typcial samples contain 50 Nb/Ge layer pairs of fixed thickness ratio. The structural and transport properties of the composites are investigated as a function of layer thickness. Likewise the critical temperature and normal-state properties, including the heat capacity and density of states (inferred from critical field measurements), are studied. Measurements were made of the parallel upper critical fields below critical T an the flutuation conductivity above critical T of samples with selected Ge thickness. Systematic behavior in anomalous positive curvature of the perpendicular upper critical fields is examined and discussed in the context of a possible manifestation of 2D vortex-lattice melting. Dissert. Abstr.

N81-32045 Illinois Univ. at Urbana.
NUCLEAR MAGNETIC RESONANCE OF PLATINUM CATALYSTS: THE DISCOVERY OF THE SURFACE RESONANCE Ph.D. Thesis
Howard Edgar Rhodes, Jr. 1981 184 p
Avail: Univ. Microfilms Order No. 8114470

Relaxation times I sub 1 and T sub 2 were measured on each sample as a function of position along the line and of temperature. Both relaxation times obeyed a universal curve independent of particle size but strongly dependent on Knight shift. The T sub 1 relaxation time displayed an anomolous increase at the low field peak in the lineshape structure. At any point along the lineshape two distinct states were observed: (1) those with long T sub 1's and (2) those with short T sub 1's. However, both states had the same T sub 2. Dissert. Abstr.

N81-32046 Maryland Univ., College Park.
THEORY OF PHASE TRANSITIONS IN CHEMISORBED TWO-DIMENSIONAL SYSTEMS Ph.D. Thesis
Lyle Dean Roelofs 1980 369 p
Avail: Univ. Microfilms Order No. 8117369

Chemisorbed overlayers on crystalline surfaces are realizations of two dimensional (2-d) lattice gases, and as such provide a testing ground for recent theoretical developments in the field of 2-d cooperative phenomena. The exact equivalence between the Ising ferromagnetic-paramagnetic transition and the c(2 x 2) order-disorder transition on a square lattice are discussed showing how several different approaches relate to one another. The more subtle analogies based on Landau-Ginzburg Hamiltonian classification are also vonsidered as well as the resulting division of 2-d second-order transitions into universality classes. Monte Carlo simulations provide an exact method of generating phase diagrams. In particular, methods of determining the order of transitions are emphasized. Dissert. Abstr.

N81-32047 Illinois Univ. at Urbana.
AN ELECTRON TUNNELING INVESTIGATION OF THE EFFECTS OF HYDROGEN AND DEUTERIUM IMPURITIES ON THE SUPERCONDUCTING PROPERTIES OF LEAD AND INDIUM Ph.D. Thesis
Bradley Ward Nedrud 1981 145 p
Avail: Univ. Microfilms Order No. 8114452

The tunneling characteristics of quench-condensed films of pure Pb, Pb with hydrogen impurities, an Pb with deuterium impurities were measured. Phonon spectra to fit the electronic density of states calculated from the data were determined. The phonon spectra for Pb/H and Pb/D exhibit additional phonon peaks at 39.4 + .5meV and 28.3 + .5meV, restectively (associated with localized models of the impurity). These peaks disappeared upon annealing the samples above 79K, presumably because of loss of the gaseous impurities. Another peak was observed in the phonon spectra for all Pb samples at approximately 35 meV, which is unaffected by annealing. This peak is attributed to the effects of phonon modes in the Al counterelectrode. The tunneling characteristics of an indium sample with hydrogen impurities was also measured. Transition temperatures measured fo quench-condensed Pb/H and Pb/H were about 0.1K lower than the values measured fo pure Pb. One doped Pb sample had an energy gap that was 0.01 meV lower than energy gaps measured for quench-condensed pure Pb. Dissert. Abstr.

N81-32048 Florida Univ., Gainesville.
AN LCAO LOCAL DENSITY FUNCTIONAL APPROACH TO SURFACE ELECTRONIC STRUCTURE CALCULATIONS Ph.D. Thesis
John Wallace Mintmire 1980 133 p
Avail: Univ. Microfilms Order No. 8115657

A method for calculating the electronic structure of thin films is presented using the local density functional formalism in the linear combination of atomic orbits (LCAO) approximation. The self-consistent solution of the resulting secular equations is made tractable through the use of fitting procedures for approximating the charge density (for the Coulomb potential) and the cube root of the charge density (for the exchange potential) as linear combinations of fitting functions, allowing the construction of a more efficient (in terms of computation effort) procedure than would otherwise be possible. Hermite-Gaussian functions comprise the basis sets, with different sets of Hermite-Gaussian functions used for the orbital basis set, for the charge density fitting functions, and for the functions used to fit the cube root of the charge density. Results are presented for two systems, the atomic hydrogen monolayer and the atomic beryllium monolayer, which demonstrate the feasibility and applicability of this approach. Techniques are discussed fo improvement of the computational procedure in order to enable calculations to be made on larger and more complex systems.
Dissert. Abstr.

N81-32049 Ohio Univ., Athens.
THERMODYNAMIC AND MAGNETIC PROPERTIES OF HUBBARD LATTICES Ph.D. Thesis
Ming-Hui Huang 1981 107 p
Avail: Univ. Microfilms Order No. 8115765

The metal-insulator transition has been one of the most pursued fields. Since band theory has failed to account for the discontinuous transition from insulator to metal with increasing bandwidth as postulated by Mott for partially filled bands, correlations brought about by electron-electron interaction have to be considered as active ingradients for the explanation of the phenomenon. Hubbard model is the simplest model that incorporates both the itenerancy of the electrons and the correlations between electrons. Therefore, the solutions to the Hubbard model are highly desirable. The two-site cluster variation method was used throughout the dissertation. In this approach, the one site and two site reduced density matrices were constructed rigorously by specifying each element in terms of the expectation values of some properly chosen operators.
Dissert. Abstr.

N81-32050 Georgetown Univ., Washington, D.C.
THEORY OF QUASIPARTICLE TUNNELING BETWEEN DISSIMILAR SUPERCONDUCTORS Ph.D. Thesis
Charles Melvin Hanson 1980 168 p
Avail: Univ. Microfilms Order No. 8116522

Quasiparticle tunneling in the Superconductor-Insulator-Superconductor geometry is studied theoretically by means of the Bogoliubov-de Gennes equations. A model is developed which preserves particle-hole symmetry throughout the system. The metals are treated in the effective-mass approximation, and each metal is characterized by its effective mass, Fermi energy, work function, pair potential, and coherence length, each of which is permitted to be different for the two metals. One of the metals is presumed to be monocrystalline and is modelled with an ellipsoidal Fermi surface characterized by its orientation and the three eigenvalues of its inverse effective-mass tensor. The pair potential in each metal varies continuously near the interfaces with a characteristic length given by the coherence length in that metal. In the insulator, account is taken of the intrinsic energy gap, applied potential, contact potential, image potential, and the potential due to a static space charge. The physical effect of the image potential on the metal-insulator interfaces is discussed, and a resulting resonance phenomenon is analyzed.
Dissert. Abstr.

N81-32051 Johns Hopkins Univ., Baltimore, Md.
RECOILLESS RAYLEIGH SCATTERING FROM PURE SINGLE CRYSTALS OF BARIUM TITANATE NEAR THE 130 DEG C FERROELECTRIC CURIE POINT Ph.D. Thesis
Mark Allen Andersen 1981 126 p
Avail: Univ. Microfilms Order No. 8116114

The ferroelectric crystal barium titanate is studied using a technique of Mossbauer spectroscopy. The technique involves scattering the Mossbauer gamma ray, which has a resolution of one part in 10 to the 12th power from a pure crystal which contains no Mossbauer isotopes. A detector, with a high resonance absorption for an unshifted Mossbauer gamma ray is used to distinguish the recoilless scattering from barium titanate from the inelastic scattering. Results are presented showing there is no change in elastic scattering as the crystal passes through the ferroelectric structural phase transition at 130 C. This is in contradiction with the Cochran model ferroelectricity. There is an abrupt change in the inelastic background at the transition, T sub tr. Just above the transition, this inelastically scattered intensity increases as .0035 times the square root of (T-T sub tr). Anomalies are seen in the scattered intensity when the barium titanate is recycled through the transition, which annealing of the crystal resolves.
Dissert. Abstr.

N81-32052 Carnegie-Mellon Univ., Pittsburgh, Pa.
KINETICS OF GRAIN BOUNDARY MIGRATION IN DILUTE COPPER-SILICON BICRYSTALS Ph.D. Thesis
Richard David Zordan 1981 149 p
Avail: Univ. Microfilms Order No. 8114640

The effect of silicon solute addition on the kinetic of grain boundary migration in copper was investigated by the reversed-capillarity technique. Single crystal seeds and the required bicrystals of varying alloy content were grown from the melt in split graphite molds, using an induction heated vertical crystal grower specifically designed and constructed for this purpose. Bicrystal misorientation was maintained at 42 deg <100> tilt, to minimize structural effects on the grain boundary migration behavior. Grain boundary mobility was measured between 275 and 400 C for several silicon contents. Qualitatively, grain boundary mobility increased as temperature was increased or solute content was decreased. For specimens containing 50 to 230 ppm silicon, the apparent activation energy for grain boundary migration was found to increase to increase from 27 to 35 kcal/mol. These values of apparent activation energy are consistent with he diffusion of silicon in the grain boundary as the rate controlling step from grain boundary migration. Grain boundary mobility was found to be universely related to impurity content, in excellent qualitative and quantitative agreement with the low velocity region of solute drag theories. Dissert. Abstr.

N81-32053 Florida Univ., Gainesville.
ELECTROCHROMISM IN THIN FILMS OF TUNGSTEN TRIOXIDE AND NEODYMIUM-DOPED TUNGSTEN TRIOXIDE Ph.D. Thesis
Aravinda Ramaswamy Haranahalli 1980 303 p
Avail: Univ. Microfilms Order No. 8115638

Electrochromism (reversible color change of a material induced by an electric field) was investigated in tungsten trioxide thin films for possible application in displays. As-deposited tungsten trioxide films were amorphous, oxygen deficient WO sub 2.76 and yellowish transparent. Heat treatment crystallized the film to a monoclinic W sub 20 O sub 58 structure. The films electrochromically colored to blue had a hydrogen tungsten bronze phase. Electrochromic absorption peaks at approximately 1000 nm and approximately 1750 nm, observed in the amorphous and crystalline films, respectively, were consistent with a model of optically excited polaron hopping. The oxide film conductivity and resistance switching with field have also been measured. The coloration time was typically 1-5 seconds. The optical efficiency (optical density change per charge injected) was 75 sq cm coulomb. The coloration at short times (< 1.0 sec for thin films, < 0.5 micrometers and up to 10 secs in thick films) was limited by the oxide film resistivity and oxide/electrolyte interfacial barriers (consisting of Helmholtz double layer and Schottky barriers).
Dissert. Abstr.

N81-32054 Illinois Univ. at Urbana-Champaign.
PHASE TRANSITIONS IN DISORDERED SYSTEMS. 1: EXCITON/ELECTRON-HOLE LIQUID/PLASMA SYSTEM IN GERMANIUM. 2: AMORPHOUS FERROMAGNETS AND SPIN GLASSES Ph.D. Thesis
Leo John Schowalter 1981 212 p
Avail: Univ. Microfilms Order No. 8114478

Experimental evidence demonstrates that a metal insulator (M-I) phase transition can occur separately from the liquid gas (L-G) transition in the exciton/electron hole (e-h) gas/e-h liquid system is stressed Ge. A strain well was used to confine the photoexcited carriers, the spectral content and spatial distribution of e-h recombination luminscence were analyzed. A line of first order transitions was observed between the exciton gas and e-h gas occurring up to 7 K. A simple expansion of the free energy of the e-h system is presented as well as lifetime measurements of the different phases of the e-h system. The thermodynamic properties of a system of Ising spins interacting with various random potentials is obtained in the Bethe-Peierls-Weiss (FPW) approximation. When the effective number of neighbors z approaches infinity, it is shown that all the magnetic properties arising from a BPW approximation, the mean random field and the Sherrington-Kirkpatrick replica treatment are identical.
Dissert. Abstr.

N81-32055 Florida Univ., Gainesville.
METALLIC HYDROGEN: A TWO-BODY APPROACH TO BAND THEORY AND A QUANTUM MECHANICAL TEST OF DIOPHANTINE METHODS Ph.D. Thesis
Stephen A. Burdick 1981 126 p
Avail: Univ. Microfilms Order No. 8115620

The feasibility of calculating the properties of bulk hydrogen from a periodically repeated cell of two atoms using biased selection is demonstrated. How conventional band theory can

be extended to use 2-electron wave functions is also shown. Born-Oppenheimer potentials were generated for a few k's for the first three bands and for r sub s = 1.23a sub B, 1.48a sub B, 1.97a sub B, 2.96a sub B and 10.84a sub B. The application of Diophantine methods to the evaluation of multi-dimensional quantum-mechanical expectation values is discussed. A 1/N convergence was found for a substantial range of N, the number of multi-dimensional integration points. For the same accuracy as biased selection, Diophantine methods required one-fourth the number of points, for the remaining range of N.
Dissert. Abstr.

N81-32056 Arizona Univ., Tucson.
STRIATIONS, SWIRLS, AND STACKING FAULTS IN CZOCHRALSKI-GROWN SILICON Ph.D. Thesis
Kalipainam Vivek Rao 1981 307 p
Avail: Univ. Microfilms Order No. 8115603

Controlled thermal annealing and oxidation treatments of wafers obtained from seed-end and tang-end regions of (100)-oriented, 75 mm diameter, Czochralski-grown, silicon single crystals are described. The radial variation of resistivity was characterized, defects studied by preferential etching and optical microscopy, and transmission electron microscopy (TEM) was carried out on selected samples. In the p-type as well as n-type crystals studied in this work, the relative radial gradient as well as the magnitude of resistivity are greater at the seed-end than at the tang-end. The effects of annealing, pre-annealing, and thermal oxidation treatments are described. The swirl patterns, as revealed by preferential etching, showed that they are pronounced in seed-end wafers and are almost absent in tang-end wafers. Bulk-type stacking faults were generated after argon annealing at 1050 C. TEM work done in this investigation showed that as-grown CZ silicon defect structure consists of an assortment of precipitates, small dislocation lines, helical type of long dislocation line, and another long linear defect with periodically spaced nodes. Dissert. Abstr.

N81-32057 Maryland Univ., College Park.
ELECTRON SPIN RESONANCE IN AMORPHOUS ALLOYS Ph.D. Thesis
Mark Leo Spano 1980 132 p
Avail: Univ. Microfilms Order No. 8117380

Electron spin resonance measurements were used to obtain the temperature dependence (4K < or = T < or = 350K) of the magnetization in amorphous (TMx-Ni1-x)75P16B6-Al3 (TM = Fe,Co) as a function of the concentration, x. At high concentrations of Fe(orCo) these metallic glasses are almost uniform ferromagnets. As the concentration, x, is lowered, the magnetic phase becomes non-uniform, as indicated by the non-constant temperature dependence of the resonance linewidth. This temperature dependence is of a simple form which is shown to be common to all systems of this type. The magnetization shows departures from simple spin wave theory at low temperatures. Included are measurements on several uniform amorphous ferromagnet. Comparisons are made to neutron scattering and vibrating sample magnetometer data. The frequency (omega) dependence of the resonance linewidth was also measured and is closely represented by the relation beta + theta omega. The constant beta represents a non-intrinsic contribution to the linewidth due to the amorphous structure of these materials. From the theta value the Landau-Lifshitz (Gilbert) parameter lambda is determined. Dissert. Abstr.

N81-32058 Maryland Univ., College Park.
OXYGEN ADSORPTION ON METALS COOLED TO LIQUID HELIUM TEMPERATURES Ph.D. Thesis
Gary Stuart Chottiner 1980 173 p
Avail: Univ. Microfilms Order No. 8116461

The adsorption of oxygen on a clean metal surface was studied on thin film samples cooled to liquid helium temperatures. At these low temperatures the reaction of O2 with the metal was slowed to the point that it became possible to distinguish stages in the adsorption process that pass too quickly at room temperature for direct observation. The formation of chemical bonds (chemisorption) between the surface atoms of a metal film and adsorbed oxygen was detected by the associated increase in electrical resistance. This increase was due to a localization of metallic conduction electrons in the bonds. The lack of any significant increase in film resistance when O2 was condensed on Sn at 6 K suggested that the oxygen was bound to the surface through a dipole interaction (physisorption). Only on heating the sample above 10 K did oxygen molecules form chemical bonds at a detectable rate. This demonstrated the existence of an energy barrier that the physisorbed O2 had to overcome before chemisorbing. Changes in the superconducting transition temperature of thin tin films during the adsorption process were also studied. Dissert. Abstr.

N81-32059 Missouri Univ. -Columbia.
DYNAMICS OF A FINITE SQUARE BICRYSTAL LATTICE WITH A LINEAR INTERFACE Ph.D. Thesis
Min Ho Lee 1980 100 p
Avail: Univ. Microfilms Order No. 8117452

An analytical solution for a finite square bicrystal lattice with a linear interface is obtained by solving the dynamical equation as a partial difference equation with two discrete cell indices. A general boundary condition is imposed in the perpendicular direction to the interface and a periodic one is imposed in the parallel direction. The nearest neighbor Rosenstock-Newel (Montroll-Potts) model of a lattice is used and the analysis is carried out in the harmonic approximation. The normal mode frequency spectrum is obtained with the use of a subsidiary expression which contains the physical parameters characterizing the location and properties of the interface and boundary. The results enable one to study many interesting physical phenomena associated with the size of two component crystals.
Dissert. Abstr.

N81-32060 New York Univ., N. Y.
TRANSVERSE ACOUSTIC IMPEDANCE OF NORMAL LIQUID He-3 Ph.D. Thesis
Frank Philip Milliken, Jr. 1981 94 p
Avail: Univ. Microfilms Order No. 8115564

Both the real and imaginary parts of the transverse acoustic impedance of normal liquid He3 were measured at frequencies of 10 and 30 MHz, pressures from 0.7 to 27 bar, and temperatures from 3 mK to 1 K. The impedance is obtained from the changes in resonance frequency and Q of a quartz crystal which is electrically driven to oscillate in a thickness shear mode while immersed in liquid He3. There are two contributions to the impedance: (1) from incoherent single quasiparticle excitations, and (2) from the excitation of the collective transverse sound mode. At 0.7 bar, the measurements of the impedance are in agreement with the predictions of Fermi liquid theory and imply that the symmetric Fermi liquid parameter F2 = 1.25 + or - 0.4 if F1 = 6.3. At higher pressures, agreement in the region omega tau < 0.3 is observed. Here, omega is the excitation frequency and tau is the quasiparticle scattering time. However, above 8 bar, the impedance is observed to be frequency dependent in the zero-sound regime. This frequency dependence cannot be explained within the present framework of Fermi liquid theory.
Dissert. Abstr.

N81-32061# Ohio State Univ., Columbus. Research Foundation.
ELECTRON DEVICE CONTACT STUDIES Interim Report, 1 Nov. 1978 - 31 Oct. 1979
Philip E. Wigen and Marlin C. Thurston Aug. 1980 46 p refs (Contract F33615-77-C-1002)
(AD-A102088; AFWAL-TR-80-1130; LPN-OSURF-710525; LPN-OSURF-764596) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report describes the initial half of a program of investigation and characterization of contacts made to GaAs. A theoretical model of contact behavior based on electron tunneling is adapted to GaAs and will be used to compare experimental results of Au contacts fabricated on Sn diffused, n-type, GaAs surface layers. The fabrication of n-type layers using spin-on dopant sources and a semiclosed chamber, in an open tube diffusion process are explained. the characterization of contact performance with a value of specific contact resistance, R sub C, and the measurement of R sub C using the transfer length method are covered. Investigation into In-Au GaAs alloyed type contacts is also presented. Author (GRA)

N81-32062# Illinois Univ. at Urbana-Champaign. Dept. of Physics.

ELECTRONIC STRUCTURE OF SOLIDS AND THEIR SURFACES AND INTERFACES Final Scientific Report, 1 Apr. 1980 - 30 Jun. 1981

A. Barry Kunz 30 Jun. 1981 141 p refs
(Grant AF-AFOSR-2989-76; AF Proj. 2306)
(AD-A101945; AFOSR-81-0571TR) Avail: NTIS HC A01/MF A01 CSCL 21/12

The past five years of this project have been devoted to development of qualitative theories of the fundamental electronic structure of pure and impure semiconductors. The basic theoretical tools and also conclusions relating to chiefly photoemission type experiments and to some extent spectroscopy of pure II-VI and III-V compounds are presented in Chapters 1 and 2 of this report. Basic complete work relating to adsorbates and their spectra are reported in Chapter 3. Several related studies are being completed at this point and several articles relating to these studies are being prepared for publication. Author (GRA)

N81-32063# Electronics Research Lab., Adelaide (Australia).

A UNIVERSAL SOLID ION SOURCE

J. Richards Oct. 1980 29 p refs
(AD-A102321; ERL-0175-TR) Avail: NTIS HC A03/MF A01 CSCL 20/7

An ion source capable of generating ions from a wide range of normally solid materials is described. The source operates by focussing a powerful electron beam onto a molten target, the electrons serving to both vapourise and ionise atoms of the target. The ion beam drawn from the source possesses many desirable properties including a low energy spread, very high purity and high brightness. Author (GRA)

N81-32064# Rockwell International Science Center, Thousand Oaks, Calif.

GROWTH OF HgCdTe BY MODIFIED MOLECULAR BEAM EPITAXY Final Report, 12 Feb. 1979 - 11 Feb. 1981

J. T. Cheung Jun. 1981 73 p refs
(Contract MDA903-79-C-0188; DARPA Order 3704)
(AD-A102272; SC5202.11FR) Avail: NTIS HC A04/MF A01 CSCL 20/2

A novel technique for depositing thin film has been developed. In this technique, a pulsed laser is used as an external power source for evaluation. The laser can also provide in situ beam processing capability when the beam is directed onto the substrate surface. Using this technique, we have demonstrated that Hg(x)Cd(1-x)Te films can be prepared by laser evaporating a HgTe/CdTe mixture. When the deposition takes place in a high vacuum, the film is Hg deficient. However, when it is carried out in a Hg back-pressure as low as .00002 Torr, the film becomes stoichiometric. Various alloy compositions can be obtained by adjusting the ratio of HgTe and CdTe in the source mixture. Author (GRA)

N81-32065# RCA Labs., Princeton, N. J.

RADIATION-HARDENED N (+) GATE CMOS/SOS Final Report, 30 Sep. 1978 - 31 May 1981

G. W. Hughes, G. J. Brucker, and R. K. Smeltzer May 1981 64 p refs Sponsored in part by Defense Nuclear Agency
(Contract N00014-78-C-0891)
(AD-A102123; PRRL-80-CR-20) Avail: NTIS HC A04/MF A01 CSCL 20/12

Process development work for a hardened N+ polysilicon-gate CMOS/SOS process has demonstrated that it is possible to make functional 4K CMOS/SOS static RAMs that are hard to 5 x 10 to the 5th power rads without the implementation of special hardened circuit design techniques. Present circuit probe yields are low, limited by the lack of a hardened low-temperature contoured field oxide. Independent research has shown that a hardened reflow process is possible for such field oxides. Development of this reflow process is nearly complete and should result in significant improvement in yields when fully integrated into the rad-hard N+ process. Author (GRA)

N81-32066# Oak Ridge National Lab., Tenn.

GENERALIZATION OF THE NERNST-EINSTEIN EQUATION FOR SELF-DIFFUSION IN HIGH-DEFECT-CONCENTRATION SOLIDS

R. A. McKee 1981 4 p refs Presented at the Intern. Conf. on Fast Ionic Transport in Solids, Gatlinburg, Tenn., 18 May 1981
(Contract W-7405-eng-26)
(CONF-810566-1) Avail: NTIS HC A02/MF A01

It is shown that the Nernst-Einstein equation can be generalized for a high defect concentration solid to relate the mobility or conductivity to the self-diffusion coefficient. This relationship is derived assuming that the diffusing particles interact strongly and that the mobility is concentration-dependent. It is derived for interstitial disordered structures, but it is perfectly general to any mechanism of self diffusion as long as diffusion in a pure system is considered. DOE

N81-32067# Oak Ridge National Lab., Tenn. Solid State Div.

THEORETICAL CALCULATIONS OF THE ELECTRONIC AND VIBRATIONAL STRUCTURE OF POINT DEFECTS IN IONIC CRYSTALS

R. F. Wood and T. M. Wilson (Oklahoma State Univ., Stillwater) 1981 22 p refs Presented at the Intern. Conf. on Defects in Insulating Crystals, Riga-Salaspils, USSR, 18 May 1981
(Contract W-7405-eng-26)
(CONF-810573-1(Draft)) Avail: NTIS HC A02/MF A01

The structure of the Hartree-Fock one-electron equations for simple point defects in ionic crystals are discussed. The importance of polarization effects due to the diffuse nature of the wavefunctions in the relaxed excited states are emphasized, and the usefulness of an effective mass approximation indicated. Several approaches to the calculation of the electronic structure are discussed and evaluated. The connection between electronic structure calculations an phonon perturbations are pointed out through a brief discussion of localized perturbation theory. DOE

N81-32068# California Univ., Livermore. Lawrence Livermore Lab.

PLASTIC DISLOCATION MOTION VIA NONEQUILIBRIUM MOLECULAR AND CONTINUUM DYNAMICS

William G. Hoover, Anthony J. C. Ladd (California Univ. at Davis), and Nathan E. Hoover (California Univ., Berkeley) 29 Sep. 1980 24 p refs Presented at Symp. on Interatomic Potentials and Computer Simulation of Defects in Metals, Pittsburg, 6-7 Oct. 1980 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-84146) Avail: NTIS HC A02/MF A01

It is noted that the classical two dimensional close-packed triangular lattice, with nearest-neighbor spring forces, is a convenient standard material for the investigation of dislocation motion and plastic flow. Two kinds of calculations, based on this standard material, are described: (1) molecular dynamics simulations, incorporating adiabatic strain described with the help of Doll's tensor, and (2) continuum dynamics simulations, incorporating periodic boundaries and dislocation interaction through stress-field superposition. DOE

N81-32069# Stanford Linear Accelerator Center, Calif.

LONG-RANGE INTERACTIONS IN LATTICE FIELD THEORY

Jeffrey Mark Rabin Jun. 1981 70 p refs
(Contract DE-AC03-76SF-00515)
(SLAC-240) Avail: NTIS HC A04/MF A01

Lattice quantum field theories containing fermions can be formulated in a chirally invariant way provided long range interactions are introduced. It is established that in weak coupling perturbation theory such a lattice theory is renormalizable when the corresponding continuum theory is, and that the continuum theory is indeed recovered in the perturbative continuum limit. In the strong coupling limit of these theories one is led to study an effective Hamiltonian decribing a Heisenberg antiferromagnet with long range interactions. Block spin renormalization group methods are used to find a critical rate of falloff of the interctions, approximately as inverse distance squared, which separates a nearest neighbor antiferromagnetic phase from a phase displaying identifiable long range effects. A duality type symmetry is present in some block spin calculations. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N81-32070 Florida Univ., Gainesville.
THERMODYNAMICS AND STATISTICAL MECHANICS OF SYSTEMS OF REACTIVE COMPONENTS WITH APPLICATIONS TO STRONG ELECTROLYTES Ph.D. Thesis
Randall Lewis Perry 1980 191 p
Avail: Univ. Microfilms Order No. 8115667

A statistical mechanical solution theory for reactive systems is developed along with a model which may be applied to correlate and predict their thermodynamic properties. The thermodynamic consistency requirements of models for reactive solutions are expressed. These are used to formulate a procedure, using matrix projections, which build these requirements into the solution model. The statistical mechanics of such a solution in the grand canonical ensemble is explored in light of the reactive constraints and the consistency requirements. By using the projection procedure, the derivative, or fluctuation properties of the components in a general reactive system are related to equilibrium relations and molecular correlation functions. The case of total dissociations as the only reactions in the solution is explored, with specific applications to strong electrolytes. First, the singularities of the long range interactions are shown to be removed by the projection procedure. Then a model is formulated based on a composite of hard-sphere and charge effects.
Dissert Abstr.

N81-32071# University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
QUANTUM CONFORMAL FLUCTUATIONS NEAR THE CLASSICAL SPACE-TIME SINGULARITY
J. V. Narlikar Nov. 1980 37 p refs Submitted for publication Sponsored by SRC Senior Visiting Fellowship
(Preprint-64) Avail: NTIS HC A03/MF A01

Quantum conformal fluctuations around a classical space-time geometry is investigated. A quantized version of Einstein's general relativity is used. The approach to quantum gravity is via path integrals. The root cause of the quantum fluctuation divergence near the singularity is shown to be in the fact that the Green's function for the conformally invariant scalar wave equation diverges at the singularity. The limitations on the validity of classical general relativity near the space-time singularity are discussed and it is argued that the notion of singularity needs to be modified once the quantum effects are taken to account. The universe as a whole may not have a unique big-bang origin at all. Rather it is made of a large (probably infinite) number of compact regions which at times go through highly dense phases.
Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

No abstracts in this category.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N81-32072 Illinois Univ., Chicago.
QUERY PROCESSING IN A DISTRIBUTED DATABASE Ph.D. Thesis
An-Chi Liu 1981 226 p
Avail: Univ. Microfilms Order No. 8116106

The distributed query processing (DQP) problem is addressed. The concept of distributed database system (DDBS) is an integrated idea in the sense that problems of DDBS are interacted with each other. The DDBS aspects associated with DQP, e.g. database decomposition, file allocation, network topology, system configuration, and functional distribution are emphasized. A file allocation problem is investigated first. It can be solved by mapping to a network flow problem. For DQP, a graph model called transaction graph is used to represent precedence relations of transactions along with DDBS characteristics. Based on the model, the query optmization problem becomes a site-mapping problem. The optimizing objective is to minimize either total time cost or response time cost. An estimation model of processing (transmission + local processing) cost is given.
Dissert. Abstr.

N81-32073*# Business and Technological Systems, Inc., Seabrook, Md.
LAMMR WORLD DATA BASE DOCUMENTATION SUPPORT AND DEMONSTRATIONS Final Report
Roland Chin and Paul Beaudet Oct. 1980 42 p refs
(Contract NAS5-26239)
(NASA-CR-166706; BTS-FR-80-129) Avail: NTIS HC A03/MF A01 CSCL 05B

The primary purpose of the World Surface Map is to provide the LAMMR subsystem with world surface type classifications that are used to set up LAMMR LEVEL II process control. This data base will be accessed solely by the LAMMR subsystem. The SCATT and ALT subsystems will access the data base indirectly through the T sub b (Brightness Temperature) Data Bank, where the surface types were updated from a priori to current classification, and where the surface types were organized on an orbital subtrack basis. The single most important factor in the design of the World Surface Maps is the ease of access to the information while the complexity of generating these maps is of lesser importance because their generation is a one-time, off-line process. The World Surface Map provides storage of information with a resolution of 7 km necessary to set flags concerning the earth's features with a different set of maps for each month of the year.
T.M.

N81-32074# Research Inst. of National Defence, Stockholm (Sweden).
THE DATA PROCESSING SYSTEM AT FOA INSTITUTION 27. SOFTWARE ORGANIZATION PRINCIPLES [FOA INSTITUTION 27 MAETDATORSYSTEM. PRINCIPIELL UPPBYGGNAD AV PROGRAMVARA]
Arnold Magnusson Jul. 1980 73 p refs In SWEDISH
(FOA-C-20361-D3) Avail: NTIS HC A04/MF A01

Data processing systems consisting of a PDP 11/40 with a multichannel analog/digital converter and disc memory were utilized for the measurement of ballistic phenomena as well as fuel consumption rates and flow processes in various types of rocket engines. Hardware and the principal expansion of software developed are described. The latter is to a great extent of a general nature, and applicable in cases where a computer is directly linked to various types of recording devices.
J.M.S.

N81-32075# Sandia Labs., Livermore, Calif. Theater Systems Studies Div.
CONSTRUCTION OF INTEGER-VECTOR LIBRARY ROUTINES FOR THE CRAY COMPUTER
J. N. Rogers and T. P. Tooman Apr. 1981 21 p refs
(Contract DE-AC04-76DP-00789)

(SAND-81-8214) Avail: NTIS HC A02/MF A01

The development and testing of seven linear algebra utility routines are documented. These routines locate extreme values, and perform vector scaling and vector element summing. They are written in CAL, the assembly language on the CRAY-1S computer. By utilizing the vector processing features of that machine, they are optimized in terms of run time. Each routine was extensively tested to ensure performance as specified. DOE

N81-32076# Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE SYMPOSIUM: PERSPECTIVES ON SCIENTIFIC AND TECHNICAL INFORMATION
May 1981 161 p refs Symp. Held at Oak Ridge, Tenn., 9-10 Sep. 1980
(Contract W-7405-eng-26)
(ORNL-5749; CONF-8009152) Avail: NTIS HC A08/MF A01

Growth of the information field as an important resource to researcher is discussed, as well as a wide range of subject-related programs, facilities, and systems that are available. Topics covered included prospect and challenges, analysis patterns, transparent systems, the role of marketing, entrepreneurial opportunites, the management of data bases and federal libraries, and a review of the field from early automated efforts to futuristic possibilites. DOE

N81-32077# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
TRANSFER OF INFORMATION FROM RESEARCHER TO CONSUMER: CHOOSING THE APPROPRIATE MEDIA
Dan Halacy May 1981 5 p refs Presented at the AS/ISES Special Interest Group on Energy and Environ. Inform. Conf., Denver, 11 May 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(SERI/TP-513-1193; CONF-810560-1) Avail: NTIS HC A02/MF A01

The diffusion of solar innovations is discussed. The objectivity, timeliness, comprehensiveness, and clarity of marketing and commercial messages are reviewed. DOE

N81-32078# PEDCo-Environmental, Inc., Arlington, Tex.
EVALUATION OF TEXAS AIR CONTROL BOARD MANAGEMENT AND OPERATIONS SYSTEMS REQUIREMENTS. PART 1: IDENTIFICATION OF TACB, PHASE 1 Final Report
Dec. 1980 83 p refs Prepered in cooperation with Young (Arthur) and Co., Austin, Tex.
(Contract EPA-68-02-2535)
(PB81-180945; EPA-906/9-80-004A-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 05B

Information for the design of management and operations systems to effectively implement and control the collection, storage, verification, and dissemination of emissions inventory information is presented. Essential emissions inventory information for meeting operational requirements are identified, the priority order in collecting, verifying, and storing the inventory information is developed and the formats for data use are established.J.D.H.

N81-32079# PEDCo-Environmental, Inc., Arlington, Tex.
EVALUATION OF TEXAS AIR CONTROL BOARD MANAGEMENT AND OPERATIONS SYSTEMS REQUIREMENTS. PART 2: APPENDICES TO THE PART 1 REPORT, PHASE 2 Final Report
Dec. 1980 251 p refs Prepared in cooperation with Young (Arthur) and Co., Austin, Tex.
(Contract EPA-68-02-2535)
(PB81-180952; EPA-906/9-80-004B-Pt-2) Avail: NTIS CSCL 05B

Background information required for the design of management and operations systems for emissions inventory information is given. Emissions inventory data requirements, general collection methodology, emissions inventory data dictionaries, and a list of interviewees are presented. J.D.H.

N81-32080# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DESIGN OF THE CSIN (CHEMICAL SUBSTANCES INFORMATION NETWORK) USER SERVICES OFFICE Final Report
Nov. 1980 106 p
(Contract EQ10AC25)
(PB81-196362; BBN-4529) Avail: NTIS HC A06/MF A01 CSCL 05B

The office will be the primary contact point between the community of network users and the network administration. Direct user support activities, such as telephone assistance and documentation writing and distribution; indirect user support activities, such as billing coordination and account management; and general system support activities, such as promotion and providing input to the network administration on user selection criteria are described. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N81-32081*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGHLIGHTS OF NASA/DOE PHOTOVOLTAICS MARKET ASSESSMENT VISIT TO COLOMBIA
[1981] 13 p
(NASA-TM-84011) Avail: NTIS HC A02/MF A01 CSCL 05C

A NASA/DOE sponsored photovoltaic market assessment team composed of representatives of NASA-Lewis Research Center, DHR, Inc., and Associates in Rural Development, Inc. recently conducted a month-long study in Colombia (June 28 - July 23). The team contacted government officials and private sector representatives in Bogota and Cali, and visited rural development and agricultural sites in the departments of Cundinamarca, Caldas, Valle, and chada to determine the potential market for American photovoltaic products in the Colombia agricultural and rural sectors. L.F.M.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N81-32082# Committee on Science and Technology (U. S. House).
NASA AUTHORIZATION, 1982, VOLUME 5
Washington GPO 1981 1322 p refs Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 8, 12, 17-21, 23-24 Mar. 1981
(GPO-79-550) Avail: Subcommittee on Space Science and Applications

The proposed NASA space research and energy technology program for fiscal year 1982 is presented. The specifics of the budget request are discussed. T.M.

N81-32083# Committee on Agriculture, Nutrition, and Forestry (U. S. Senate).
RESOURCE CONSERVATION AND DEVELOPMENT ACT
Washington GPO 1980 210 p Hearing on S. 1942 before the Subcomm. on Environ., Soil Conserv., and Forestry of the Comm. on Agr., Nutr., and Forestry, 96th Congr., 2nd Sess., 29 Jul. 1980
(GPO-67-017) Avail: Subcommittee on Environment, Soil Conservation, and Forestry

Testimony is provided on cooperation between local governments and the Federal government in resolving mutual problems of resource conservation and rural development. Small community and rural needs are addressed as well as management aspects of the profound demographic and economic changes that are taking place in rural America. It is proposed to operate and maintain a planning process including actions to conserve and better utilize land, develop natural resources, and improve the economic and environmental conditions of rural areas. The proposed plan of action should achieve improved economic

opportunities, improved living standards, and an enhanced environment through the conservation, development, and proper use of natural in rural areas. J.M.S.

N81-32084# Library of Congress, Washington, D. C. Copyright Office.
HOW TO INVESTIGATE THE COPYRIGHT STATUS OF A WORK
1981 8 p refs
(Circular-R22) Avail: NTIS HC A02/MF A01

The investigation of copyright status is described. The impact of the copyright act of 1976 on works published since January 1, 1978 is summarized. The duration of copyright protection, requirements for the copyright notice, and the effect of absence of the copyright notice on the status of a work are considered. Instructions for making a copyright search, and the information needed before a search can be conducted by the Copyright Office are given. J.D.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N81-32085* National Aeronautics and Space Administration, Washington, D. C.
NASA TECH BRIEFS INDEX, 1980, VOL. 5 NOS. 1-4
1980 108 p
(NASA-SP-5021(22)) Avail: NTIS HC $11.00 CSCL 05A

Approximately 558 announcements of new technology derived from the research and development activities of NASA are presented. Emphasis is placed on information considered likely to be transferrable across industrial, regional, or disciplinary lines. Subject matter covered includes: electronic components and circuits; electronic systems; physical sciences; materials; life sciences; mechanics; machinery; fabrication technology; and mathematics and information sciences. J.M.S.

N81-32086*# Denver Research Inst., Colo. Program for Transfer Research and Impact Studies.
SPACE BENEFITS: THE SECONDARY APPLICATION OF AEROSPACE TECHNOLOGY IN OTHER SECTORS OF THE ECONOMY
[1981] 240 p refs
(Contract NASw-3113)
(NASA-CR-164733) Avail: NTIS HC A11/MF A01 CSCL 05A

Some 585 examples of the beneficial use of NASA aerospace technology by public and private organizations are described to demonstrate the effects of mission-oriented programs on technological progress in the United States. General observations regarding technology transfer activity are presented. Benefit cases are listed in 20 categories along with pertinent information such as communication link with NASA; the DRI transfer example file number; and individual case numbers associated with the technology and examples used; and the date of the latest contract with user organizations. Subject, organization, geographic, and field center indexes are included. A.R.H.

N81-32087*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-POWER BASELINE AND MOTORING TEST RESULTS FOR THE GPU-3 STIRLING ENGINE Final Report
Lanny G. Thieme Jun. 1981 37 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-82646; DOE/NASA-51040-31; E-902) Avail: NTIS HC A03/MF A01 CSCL 13F

Test results are given for the full power range of the engine with both helium and hydrogen working fluids. Comparisons are made to previous testing using an alternator and resistance load bank to absorb the engine output. Indicated power results are presented as determined by several methods. Motoring tests were run to aid in determining engine mechanical losses. Comparisons are made between the results of motoring and energy-balance methods for finding mechanical losses. T.M.

N81-32088*# Transportation Systems Center, Cambridge, Mass.
FUEL ECONOMY AND EXHAUST EMISSIONS CHARACTERISTICS OF DIESEL VEHICLES: TEST RESULTS OF A PROTOTYPE FIAT 131 NA 2.4 LITER AUTOMOBILE
S. S. Quayle, M. M. Davis, and R. A. Walter May 1981 82 p refs
(NASA Order C-32817-D; Contract DE-AI01-80CS-50194)
(NASA-CR-165281; DOE/NASA/281751; DOT-TSC-NASA-81-1) Avail: NTIS HC A05/MF A01 CSCL 13B

The vehicle was tested on a chassis dynamometer over selected drive cycles and steady-state conditions. Two fuels were used, a U.S. no. 2 diesel and a European diesel fuel. The vehicle was tested with retarded timing and with and without an oxidation catalyst. Particulate emission rates were calculated from dilution tunnel measurements and large volume particulate samples were collected for biological and chemical analysis. It was determined that while the catalyst was generally effective in reducing hydrocarbon and carbon monoxide levels, it was also a factor in increasing particulate emissions. Increased particulate emission rates were particularly evident when the vehicle was operated on the European fuel which has a high sulfur content. T.M.

N81-32089# EMCON Associates, San Jose, Calif.
FEASIBILITY STUDY: UTILIZATION OF LANDFILL GAS FOR A VEHICLE FUEL SYSTEM, ROSSMAN'S LANDFILL, CLACKAMUS COUNTY, OREGON
Jan. 1981 206 p refs Sponsored in cooperation with Cal. Recovery Systems, Inc. and Gas Recovery Systems, Inc.
(Contract DE-FG01-80RA-50366)
(DOE/RA-50366/T1) Avail: NTIS HC A10/MF A01

The technical and economic feasibility of recovering the methane generated in the landfill for the refueling of vehicles is examined. The expected methane yield and the development of a conceptual gas gathering system, gas processing, compressing, and storage systems, and methane fueled vehicle systems are among the factors addressed. Cost estimates made for each area of study are given. Reasoning that gasoline prices will continue to rise and that approximately 18,000 vehicles in the US have been converted to operate on methane, a project is proposed to use this landfill as a demonstration site to produce and process methane and to fuel a fleet (50 to 400) vehicles with the gas produced in order to obtain performance and economic data on the systems used from gas collection through vehicle operation. DOE

N81-32090# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
THE DEVELOPMENT AND APPLICATION OF A DISAGGREGATE POISSON MODEL FOR TRIP GENERATION
C. J. Ruygrok and P. G. vanEssen Delft Netherlands Organization for Applied Scientific Research TNO Mar. 1980 30 p refs Presented at 59th Ann. Meeting of the Transportation Res. Board, Jan. 1980 Revised
(IWIS-A-80-VK-01-01) Avail: NTIS HC A03/MF A01

A disaggregate Poisson model for trip generation, prerequisite for modelling travel demand, is presented. The state of the art of modelling trip generation and possible improvements are discussed. In the proposed model, the lambda parameter depends on a number of household characteristics. A maximum likelihood estimation method is discussed of the two cases in which the lambda parameter is additive and multiplicative in the explanatory variables. Examples concerning a submodel of a city transportation study modelling shopping and personal business trips are given. The estimation results appear to be superior to the results of linear and nonlinear regressions on the same data. An analytical aggregation procedure is also discussed. Author (ESA)

N81-32091# Ecosometrics, Inc., Bethesda, Md.
WISCONSIN MANUAL TO COORDINATE ELDERLY AND HANDICAPPED TRANSPORTATION SERVICES IN RURAL

AND SMALL URBAN COUNTIES
Sue F. Knapp, Hannah Worthington, and Jon E. Burkhardt Madison Wisconsin Dept. of Transportation 24 Dec. 1980 277 p refs
(PB81-197865; UMTA-WI-09-8004-81-1) Avail: NTIS HC A13/MF A01 CSCL 13B

The manual was prepared for use by local officials and staff to assist in the development of coordinated county wide transportation services for the elderly and handicapped (E&H). It is intended for use in the coordination of both specialized and public transportation in the predominantly rural counties of Wisconsin. The manual shows how to prepare a plan to the development of specialized transportation services in rural and small urban counties. The manual describes steps to improve coordination, and it includes methods and guidance for projecting costs and ridership, managing financial affairs, and implementing new or revised services. GRA

N81-32092# Falcon Research and Development Co., Buffalo, N. Y.
DYNAMOMETER AND TRACK MEASUREMENT OF PASSENGER CAR FUEL ECONOMY Final Report
Jeffrey Bernard and Sol Kaufman Mar. 1981 137 p refs
(Contract EPA-68-03-2835)
(PB81-196446; EPA-460/3-81-002) Avail: NTIS HC A01/MF A01 CSCL 13F

The factors contributing to differences in fuel economy measured on a road in consumer service as compared to EPA estimates using a dynamometer are considered. The relationship between the fuel economy of production cars tested on dynamometer equipment and the fuel economy they achieve when operated over the same driving sequence on a test track is analyzed. The test track simulates a subset of driving conditions that might be encountered in actual driving. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N81-32093 Rice Univ., Houston, Tex.
A SPECTROPHOTOMETRIC STUDY OF H 2 REGIONS IN CHEMICALLY YOUNG GALAXIES Ph.D. Thesis
David Leroy Talent 1981 172 p
Avail: Univ. Microfilms Order No. 8116999

The optical spectra of thirty-four emission nebulae in thirteen irregular and late-type spiral galaxies were investigated. From measurement of diagnostic emission-line strengths, the relative abundances of He, N, O, Ne, and S (in some cases) were calculated with respect to H for each nebula. Electron densities were derived from the ratio of the [SII] line intensities, while temperatures were obtained from the ratio of the [OIII] line intensities. The galaxies examined during this study were found to be consistently underabundant in the metals with respect to earlier-type galaxies. The average abundances (by number) for the galaxies studied are presented, and interpreted. The initial mass function is considered. A value for the primary yield of N is determined. Examination of the metallicity parameter, Z, versus the astration parameter suggests that the gassiest galaxies have experienced the least astrophysical processing, indicating that the average star formation rate decreases as galaxy mass decreases. The pregalactic He abundance, by mass, was determined. The present average density of the Universe is found. Dissert. Abstr.

N81-32094 Michigan Univ., Ann Arbor.
SPECTROPHOTOMETRY OF GALACTIC SUPERNOVA REMNANTS Ph.D. Thesis
Robert Anthony Fesen 1981 286 p
Avail: Univ. Microfilms Order No. 8116232

Data for several filaments of the Cygnus Loop, IC443, and the Crab Nebula were obtained and are discussed in detail. Eight other galactic remnants were studied in less depth. We find that IC443's spectra can be adequately matched using theoretical shock models. The Cygnus Loop's filaments exhibit a wide range of spectral line intensities which cannot be fully described by these theoretical models. Discrepancies between the observed and the model calculated line intensities are suggested to be due in part to the existence of an inhomogeneous interstellar medium. The filaments of the Crab Nebula may not be chemically homogeneous, particularly in helium. However, this must be checked by detailed model calculations. A study of supernova line emission ratios provides additional criteria for discriminating SNR spectra from those of HII regions using [OI] and [OII] relative line strengths. Dissert. Abstr.

N81-32095*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DECAMETER-WAVE RADIO OBSERVATIONS OF JUPITER DURING THE 1977 APPARITION
J. K. Alexander, M. L. Kaiser, J. R. Thieman, and S. S. Vaughan (Computer Science Corp., Silver Spring, Md.) Sep. 1978 54 p refs
(NASA-TM-84012; X-695-78-25) Avail: NTIS HC A04/MF A01 CSCL 03A

A catalog of observations of Jupiter's sporadic decameter wavelength radio emissions obtained with the Goddard Space Flight Center Jupiter Monitor Network between June 1977 and May 1978 is presented. Data were collected using the Goddard Space Flight Center station in Greenbelt, MD. and at facilities installed at Orroral Valley (Canberra), Australia and the Nancay Radio Observatory in France. Observations were obtained daily at frequencies of 16.7 and 22.2 MHz using five-element Yagi antennas at each end of a two-element interferometer. Plots of the two dimensional emission occurrence probability distribution are given. M.G.

N81-32096*# Electronic Vision Corp., San Diego, Calif.
SPACE TELESCOPE DIGICON TECHNOLOGY Final Status Report
Hemmo R. Alting-Mees 22 Mar. 1979 60 p refs Prepared for Calif. Univ., San Diego, La Jolla, Calif.
(Contract NAS5-25054)
(NASA-CR-166704) Avail: NTIS HC A04/MF A01 CSCL 03A

The objective of this program was to develop the technology and construct a number of tubes conforming to the chosen configuration. A total of ten starts were made and ten tubes went through to test. Of the ten tubes three were CsI on LiF, six were CsTe on MgF2 and one was KNaCsSb on SiO2. All three faceplate crystals sealed successfully using indium as the sealant. In addition, a number of test seals were made and two photocathode sample runs were made. The tasks E-field, faceplate, anti-corona and electron optical analysis were actively pursued and the results integrated into the BASD HRS project. T.M.

N81-32097*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ORIGIN OF THE CRAB NEBULA AND THE ELECTRON CAPTURE SUPERNOVA IN 8-10 M SOLAR MASS STARS
Kenichi Nomoto Jul. 1981 11 p refs Submitted for publication
(NASA-TM-82179) Avail: NTIS HC A02/MF A01 CSCL 03A

The chemical composition of the Crab Nebula is compared with several presupernova models. The small carbon and oxygen abundances in the helium-rich nebula are consistent with only the presupernova model of the star whose main sequence mass was MMS approximately 8-9.5 M. More massive stars contain too much carbon in the helium layer and smaller mass stars do not leave neutron stars. The progenitor star of the Crab Nebula lost appreciable part of the hydrogen-rich envelope before the hydrogen-rich and helium layers were mixed by convection. Finally

it exploded as the electron capture suprnova; the O+Ne+Mg core collapsed to form a neutron star and only the extended helium-rich envelope was ejected by the weak shock wave.
Author

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N81-32098 Arizona Univ., Tucson.
EFFECTS OF MAGNETIC FIELDS ON MAIN SEQUENCE STARS Ph.D. Thesis
Eugene Norman Hubbard 1981 99 p
Avail: Univ. Microfilms Order No. 8116699

A number of effects of low to medium strength (< 2000 gauss photospheric) magnetic fields on otherwise normal stars are proposed and examined. Magnetic perturbations to the standard stellar structure and evolutionary calculations in the core, the deep envelope, and the extreme outer envelope in intermediate to high mass stars are considered. In the stellar core the gas pressure probably far exceeds the magnetic field pressure term so that the only effect of such a field may come from its inhibiting convection in the core. Isochrones of both convective and radiative core models of 2 to 5 solar mass are presented. In the deep envelope, one may expect to see mixing of partially nuclear processed material driven by rising and falling magnetic flux tubes. The effects of this mixing will be brought to the surface during the deep convection phase of the star's tenure as a red giant. This model is used to predict a signature for magnetic mixing based on the CNO isotope and abundance ratios. In the outer envelope the gas pressure is low enough that one might expect to see a perturbation of the stellar structure due to the magnetic field pressure itself. Finally, the evidence for the existence of non-magnetic neutron stars is considered. Dissert. Abstr.

N81-32099 California Inst. of Tech., Pasadena.
HIGH SPECTRAL RESOLUTION OBSERVATIONS OF THE MOLECULAR HYDROGEN EMISSION IN THE ORION MOLECULAR CLOUD Ph.D. Thesis
Daniel Nadeau 1981 105 p
Avail: Univ. Microfilms Order No. 8117195

Line profiles of the vibrationally excited H2 gas in the Orion molecular cloud are presented. The mapping measurements show variations from the periphery where the profiles are narrow, symmetric and have a peak velocity equal to that of the molecular cloud to the center of the region of emission where the profiles are wide, asymmetric and blueshifted. The line profiles do not appear to vary with time or with the energy of the upper level of the transition. The results are interpreted by a model of a radially expanding flow of gas. From a study of H2 excitation behind a shock front and in a magnetic precursor ahead of a shock wave, it is concluded that the high velocity emission comes from the high velocity gas in the low, and the low velocity emission comes from gas in the molecular cloud surrounding the flow, with density inhomogeneities contributing to the detailed profiles. The H2 emission is compared to the CO and H2O maser emission and to the infrared continuum sources.
Dissert. Abstr.

N81-32100*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCRETING WHITE DWARF MODELS FOR TYPE 1 SUPERNOVAE. 1: PRESUPERNOVA EVOLUTION AND TRIGGERING MECHANISMS
Kenichi Nomoto Aug. 1981 53 p refs Submitted for publication
(NASA-TM-83810) Avail: NTIS HC A04/MF A01 CSCL 03B

As a plausible explosion model for a Type I supernova, the evolution of carbon-oxygen white dwarfs accreting helium in binary systems was investigated from the onset of accretion up to the point at which a thermonuclear explosion occurs. The relationship between the conditions in the binary system and the triggering mechanism for the supernova explosion is discussed, especially for the cases with relatively slow accretion rate. It is found that the growth of a helium zone on the carbon-oxygen core leads to a supernova explosion which is triggered either by the off-center helium detonation for slow and intermediate accretion rates or by the carbon deflagration for slow and rapid accretion rates. Both helium detonation and carbon deflagration are possible for the case of slow accretion, since in this case the initial mass of the white dwarf is an important parameter for determining the mode of ignition. Finally, various modes of building up the helium zone on the white dwarf, namely, direct transfer of helium from the companion star and the various types and strength of the hydrogen shell flashes are discussed in some detail. Author

N81-32101# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ELECTRIC FIELDS IN EARTH ORBITAL SPACE Final Report
W. P. Olson, K. A. Pfitzer, and W. J. Scotti Jun. 1981 39 p refs
(Contract N00014-80-C-0796)
(AD-A102550; MDC-G9606) Avail: NTIS HC A03/MF A01 CSCL 04/1

The formalism of pressure balance is reexamined without the assumption of specular reflection. In a realistic (non-uniform) magnetic field topology a significant fraction of particles incident on the magnetopause gain access to the magnetosphere. This is especially true on the flanks of the tail. Entering particles must make a significant contribution to the plasma sheet. Particle energization in the inner magnetosphere caused by the daily wobble of the geomagnetic dipole and the magnetospheric response was also quantitatively examined. Particles with initial energies near 10 keV can gain up to 6 keV energy over a period of a few days. Author (GRA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N81-32102* National Aeronautics and Space Administration, Washington, D. C.
VOYAGER BACKGROUNDER
Aug. 1981 70 p
(NASA-News-Release-81-116; P81-10118) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The Voyager spacecraft and experiments are described. The spacecraft description includes the structure and configuration, communications systems, power supplies, computer command subsystems, and the science platform. The experiments discussed are investigations of cosmic rays, low-energy charged particles, magnetic fields, and plasma waves, along with studies in radio astronomy photopolarimetry. The tracking and data acquisition procedures for the missions are presented. T.M.

N81-32103 Rice Univ., Houston, Tex.
INERT GASES IN FIFTEEN IRON METEORITES Ph.D. Thesis
Russell Lumir Palma 1981 216 p
Avail: Univ. Microfilms Order No. 8116985

The meteorites analyzed were chosen because of their low cosmic ray exposure ages; most had known exposure ages of less than 200 million years. All of the meteorite samples show evidence of having a cosmogenic inert gas component. Large deviations from the predicted cosmogenic compositions correlate with short cosmic ray exposure ages and often indicate the presence of a trapped atmospheric-like inert gas component. Those samples showing anomalous behavior in one inert gas tend to show anomalous behavior for all the inert gases. The inert gas data from most samples are consistent with the helium, neon, and argon concentrations being largely of cosmo-

genic origin and the kryton and xenon resulting from a mix of solar wind, atmospheric, and cosmogenic compositions. However, there are several meteorites which are anomalous with respect to the above interpretation. Krypton and xenon were measured in five of the iron meteorites, the results suggesting that many xenon components may be trapped in the metal stage.
Dissert. Abstr.

N81-32104 Michigan Univ., Ann Arbor.
THE IONOSPHERE OF SATURN Ph.D. Thesis
Jack Hunter Waite, Jr. 1981 275 p
Avail: Univ. Microfilms Order No. 8116353

A one dimensional theoretical model of the Saturn upper atmosphere and ionosphere was developed and used to study the effects of various free parameters on the structure and composition of the ionosphere. The model was used to solve the diffusion equations for all the major neutral species above the ammonia cloud tops: H2, He, H, CH4, CH3, C2H2, C2H4, and C2H6. It also contained a complete ionosphere model including the diffusing ion H(+) and the photochemical ions C2H5(+), HC5(-), CH4(-), CH3(+), CH2(-), CH(-), He(-), HeH(+), H2(+), and H3(-). Solutions to the neutral, ion, and electron conduction equations were also obtained. Photoelectron and electron precipitation processes were included by solving a two stream electron transport code. All components of the model were coupled together to provide a self-consistent solution to the structure, composition, and temperature of the upper atmosphere and ionosphere. Dissert. Abstr.

N81-32105 Arizona State Univ., Tempe.
THE ABUNDANCE AND DISTRIBUTION OF CHLORINE IN METEORITES Ph.D. Thesis
James Gordon Tarter 1981 192 p
Avail: Univ. Microfilms Order No. 8116431

Chlorine was determined in 52 stony meteorites and 49 iron meteorites by combustion-ion chromatography. This technique involved the liberation of the chlorine from the sample using an induction furnace. The volatile chlorine containing species were trapped in an aqueous solution and the concentrations of the species of interest were measured using an ion chromatograph. The sample size combusted varied from 50 mg to 1 gram.
Dissert. Abstr.

N81-32106# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE VOYAGER 1 SATURN ENCOUNTER AND THE COSMOGONIC SHADOW EFFECT
Hannes Alfven Apr. 1981 34 p refs Submitted for publication
(TRITA-EPP-81-01; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

The cosmogonic shadow effect is described. If a dusty plasma rotates around a central body with an axisymmetric dipole field, when the electromagnetic forces dissappear the medium will collapse to two thirds of its original central distance. The Voyager 1 results demonstrate that the macrostructure of the Saturnian ring system can be explained as a result of this effect working at the formation of the system. The agreement between the theoretical results and the observations is better than a few percent. The observation results demonstrate that during their formation both the Saturnian rings and the asteroid belt passed trough a plasma state dominated by electromagnetic effects.
Author (ESA)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N81-32107*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
THE SOLAR SPECTRAL IRRADIANCE 1200-3184 A NEAR SOLAR MAXIMUM, 15 JULY 1980
George H. Mount and Gary J. Rottman 15 Jul. 1980 21 p refs
(Grant NsG-7559)
(NASA-CR-164727) Avail: NTIS HC A02/MF A01 CSCL 03B

Full disk solar spectral irradiances near solar maximum were obtained in the spectral range 1200 to 3184 A at a spectral resolution of approximately 1 A from rocket observations above White Sands Missile Range. Comparison with measurements made during solar minimum confirm a large increase at solar maximum in the solar irradiance near 1200 A with no change within the measurement errors near 2000 A. Irradiances in the range 1900 to 2100 A are in excellent agreement with previous measurements, and those in the 2100 to 2500 A range are lower than separate previous results in this range. Agreement is found with previous values 2500 to 2900 A A, and then fall below those values 2900 to 3184 A. M.G.

N81-32108*# Saint Patrick's Coll., Maynooth (Ireland). Dept. of Physics.
CHROMOSPHERIC AND PHOTOSPHERIC EVOLUTION OF AN EXTREMELY ACTIVE SOLAR REGION IN SOLAR CYCLE 19
Susan M. P. McKenna-Lawlor Aug. 1981 230 p refs
(NASA Order H-12261B)
(NASA-CR-3377; M-323) Avail: NTIS HC A11/MF A01 CSCL 03B

a comprehensive investigation was made of phenomena attending the disk passage, July 7 to 21, 1959, of active solar center HAO-59Q. At the photospheric level that comprised an aggregate of groups of sunspots of which one group, Mt. Wilson 14284, showed all the attributes deemed typical of solar regions associated with the production of major flares. A special characteristic of 59Q was its capability to eject dark material. Part of this material remained trapped in the strong magnetic fields above group 14284 where it formed a system of interrelated arches, the legs of which passed through components of the bright chromospheric network of the plage and were rooted in various underlying umbrae. Two apparently different kinds of flare were identified in 59Q; namely, prominence flares (which comprised brightenings within part of the suspended dark prominence) and plage flares (which comprised brightenings within part of the chromospheric network). Prominence flares were of three varieties described as 'impact', 'stationary' and 'moving' prominence flares. Plage flares were accompanied in 3 percent of cases by Type III bursts. These latter radio events indicate the associated passage through the corona of energetic electrons in the approximate energy range 10 to 100 keV. At least 87.5 percent, and probably all, impulsive brightenings in 59Q began directly above minor spots, many of which satellites to major umbrae. Stationary and moving prominence flares were individually triggered at sites beneath which magnetic changes occurred within intervals which included each flare's flash phase. M.G.

N81-32109# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
STUDY OF GEOMAGNETIC STORMS, SOLAR FLARES, AND CENTERS OF ACTIVITY IN 1977
E. Ruth Hedeman and Helen Dotson Prince Hanscom AFB, Mass. AFGL Jan. 1981 24 p refs
(Contracts N00024-78-C-5384; MIPR-FY-7121-81-10000; AF Proj. 2311)
(AD-A102301; SCIENTIFIC-2; SR-2; AFGL-TR-81-0024) Avail: NTIS HC A02/MF A01 CSCL 03/2

Detailed comparison is made between various types of geomagnetic storms, solar flare activity and coronal holes for the year 1977. The Comprehensive Flare Index (CFI), which quantifies X-ray, optical and radio emission, again proves to be an increasing reliable predictor (statistically) of flare-associated geomagnetic storms as the value of the CFI increases. Two sequences of recurrent geomagnetic storms could be associated with coronal holes extending below 30 deg heliographic latitude. The two most active regions of the year resulted in 'flare-sequential' storms in which a coronal hole (and related sequential storms) developed subsequent to the decay of flare production in an adjacent active region. Author (GRA)

N81-32110# Los Alamos Scientific Lab., N. Mex.
ROCKET BORNE SOLAR ECLIPSE EXPERIMENT TO MEASURE THE TEMPEATURE STRUCTURE OF THE SOLAR

CORONA VIA LYMAN-ALPHA LINE PROFILE OBSERVATIONS
H. V. Argo 1981 14 p refs Presented at the Solar Eclipse Symp., New Delhi, 28 Jan. 1981
(Contract W-7405-eng-36)
(LA-UR-81-1247; CONF-810144-1) Avail: NTIS HC A02/MF A01

A rocket borne experiment to measure the temperature structure of the inner solar corona via the doppler broadening of the resonance hydrogen Lyman alpha radiation scattered by ambient neutral hydrogen atoms attempted during the 16 Feb. 1980 solar eclipse is described. Two Nike-Black Brant V sounding rockets carrying instrumented payloads were launched into the path of the advancing eclipse umbra from the San Marco satellite launch platform 3 miles off the east coast of Kenya. DOE

N81-32111# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Solar-Terrestrial Physics Div.
SOLAR-GEOPHYSICAL DATA NUMBER 437, JANUARY 1981. PART 1: (PROMPT REPORTS) DATA FOR DECEMBER 1980, NOVEMBER 1980 AND LATE DATA
Helen E. Coffey, ed. Jan. 1981 179 p 2 Vol.
(PB81-198087; SGD-437-Pt-1; NOAA-81031301) Avail: NTIS HC A09/MF A01 CSCL 03B

In addition to an index for 1979-1980, this prompt report provides data for December 1980 on: alert periods, daily solar indices, solar flares, solar radio emission, solar wind measurements, coronal holes, spacecraft observations, inferred interplanetary magnetic field polarities, mean solar magnetic field, and Boulder Geomagnetic Substorm Log. It also provides data for November on: daily solar activity centers, sudden ionospheric disturbances, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. Late data includes: cosmic rays Huancayo July-Sept. 1980 and sudden commencements and solar flare effects October 1980. GRA

N81-32112# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Solar-Terrestria Physics Div.
SOLAR-GEOPHYSICAL DATA NUMBER 437, JANUARY 1981. PART 2: (COMPREHENSIVE REPORTS) DATA FOR JULY 1980 AND MISCELLANEA
Helen E. Coffey, ed. Jan. 1981 61 p 2 Vol.
(PB81-198095; SGD-437-Pt-2; NOAA-81031302) Avail: NTIS HC A04/MF A01 CSCL 03B

In addition to an index for 1979-1980, this issue of comprehensive reports provides data for July 1980 on: solar radio emission, energetic solar particles and plasma, solar X-ray radiation and mass ejections from the sun. A new schedule will cause the Daily Flare Index and the Regional Flare Index to appear 13 and 14 months from the data of observation. Miscellaneous data includes. Active Regions May 12 - June 8, 1980, Synoptic Solar Maps May 12 - June 8, 1980, Energetic Solar Particles January 1980, and Reduced Magnetograms 1979. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

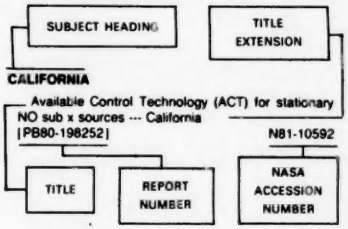
N81-32113 California Inst. of Tech., Pasadena.
A BALLOON MEASUREMENT OF THE ISOTOPIC COMPOSITION OF GALACTIC COSMIC RAY BORON, CARBON, AND NITROGEN Ph.D. Thesis
James Frederick Zumberge 1981 128 p
Avail: Univ. Microfilms Order No. 8115611

The isotopic compositions of galactic cosmic ray boron, carbon, and nitrogen were measured at energies near 300 MeV amu(-1), using a balloon-borne instrument at an atmospheric depth of 5 g cm(-2). The calibrations of the detectors comprising the instrument are described. The saturation properties of the cesium iodide scintillators used for measurement of particle energy are studied in the context of analyzing the data for mass. The achieved rms mass resolution varies from 0.3 amu at boron to 0.5 amu at nitrogen, consistent with a theoretical analysis of the contributing factors. A model of galactic propagation and solar modulation is described. Assuming a cosmic ray source composition of solar-like isotopic abundances, the model predicts abundances near Earth consistent with the measurements. Dissert. Abstr.

99 GENERAL

No abstracts in this category.

Typical Subject Index Listing



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A

A-10 AIRCRAFT
A-10/TF34 Turbine Engine Monitoring System (TEMS) N81-31211

ABNORMALITIES
Disposition of electrocardiographic abnormalities in aviation N81-31838

ABRASIVES
Advanced turbine blade tip seal system N81-31205
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites
[RAE-TR-75144] N81-31297

ABSORPTION SPECTRA
Absorption spectroscopy of combustion gases using a tunable diode laser N81-31302

ABSTRACTS
Reports from the Departments of Electron and Plasma Physics: Index and Abstracts, 1980
[TRITA-EPP-80-13] N81-32042

ABUNDANCE
The abundance and distribution of chlorine in meteorites N81-32105

ACCELERATED LIFE TESTS
Accelerated life testing and safe dose estimation when there are competing causes of failure N81-31557

ACCELERATION (PHYSICS)
Effects of missile and target acceleration parameters on time-to-go estimation
[AD-A102091] N81-31273
Electromagnetic fields resulting from simple acceleration N81-31413

ACCELERATION STRESSES (PHYSIOLOGY)
BIOCONAID system (bionic control of acceleration induced dimming)
[AD-A102510] N81-31234
Modeling the effects of sustained accelerations on pilot tracking performance N81-31839

ACCELERATION TOLERANCE
In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819

ACCELEROMETERS
The Cactus accelerometer N81-31177
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980
[AD-A102495] N81-31187
Application of radiation pressure measurements to the monitoring of the solar constant --- satellite borne accelerometer N81-31782

ACCURACY
Identification and determination of strapdown error-parameters by laboratory testing N81-31179
Reliability of ultrasonic weld interrogation methods, phase 1
[PB81-194177] N81-31560

ACETYLENE
The reaction of HF with polyacetylene
[AD-A102293] N81-31310
Photoinitiated doping of polyacetylene
[AD-A102291] N81-31369

ACID RAIN
Prevention of corrosion and fatigue failure of helicopter gas turbine compressors
[NLR-MP-80024-U] N81-31222

ACIDS
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285

ACOUSTIC ATTENUATION
Flying helmet attenuation, and the measurement, with particular reference to the Mk 4 helmet N81-31473

ACOUSTIC EMISSION
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530

ACOUSTIC IMPEDANCE
Transverse acoustic impedance of normal liquid He-3 N81-32060

ACOUSTIC MEASUREMENTS
Recognition test for an open set of talkers represented by their acoustic parameters
[FUB-2-1981] N81-31446
STI: An objective measure for the performance of voice communication systems N81-31465
Acoustoelastic measurement of residual stresses N81-31571

ACOUSTICS
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453
Turbomachinery noise studies of the AiResearch QCGAT engine with inflow control
[NASA-TM-82694] N81-31957

ACRYLIC RESINS
Polyacrylamide polymer viscosity as a function of brine composition
[DOE/BETC/RI-80/12] N81-31373

ACTIVATED CARBON
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693

ACTIVITY (BIOLOGY)
The changing atmosphere: Its role in climate --- biological aspects N81-31776

ACTUATORS
Fiber optics for aircraft engine/inlet control
[NASA-TM-82654] N81-31190

ADAPTIVE CONTROL
Automated Plasma Spray (APS) process feasibility study
[NASA-CR-165418] N81-31193
The effect of a pulsed interference signal on an adaptive array
[AD-A102258] N81-31430
Optimum beamforming subject to multiple linear constraints
[AD-A102322] N81-31435
An algebraic approach to data-adaptive array processing
[AD-A101872] N81-31438
Adaptive control system for line-commutated inverters
[NASA-CASE-MFS-25209-1] N81-31480
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481
Almost sure convergence of adaptive identification prediction and control algorithms
[AD-A102041] N81-31905

ADAPTIVE FILTERS
Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428

ADDITIVES
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366

ADHESION
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287

ADHESIVE BONDING
The effect of elastomer chain length on properties of silicone-modified polyimide adhesives
[NASA-TM-83172] N81-31360
Structure and properties of polymers and organosilanes absorbed onto oxidized aluminum and titanium
[AD-A102365] N81-31370
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581

ADHESIVES
The effect of elastomer chain length on properties of silicone-modified polyimide adhesives
[NASA-TM-83172] N81-31360

ADSORBENTS
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693

AERATION
Air uptake and air release behavior of lubricating oils and hydraulic fluids
[DGMK-31] N81-31376

AERODYNAMIC COEFFICIENTS
High Reynolds number research - 1980
[NASA-CP-2183] N81-31130
The National Transonic Facility: Review and status report N81-31131

AERODYNAMIC CONFIGURATIONS
Analytical determination of dynamic stability parameters N81-31117

Some applications of aerodynamic formulations to problems in aircraft dynamics N81-31121
High Reynolds number research - 1980 [NASA-CP-2183] N81-31130
NTF management considerations N81-31134
Pathfinder model program for the National Transonic Facility N81-31135
Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142
Scientific report of the Research Department for Fluid Dynamics N81-31520

AERODYNAMIC DRAG
Orbital decay in a dynamic atmosphere [UTIAS-244] N81-31266

AERODYNAMIC FORCES
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980 [AD-A102495] N81-31187
Transition and conversion trim-maps for the AV-8A VTOL aircraft [AD-A102155] N81-31188

AERODYNAMIC LOADS
Unsteady airloads on oscillating wings in post-stall condition [DFVLR-FB-81-16] N81-31158
The nature of operating flight loads and their effect on propulsion system structures N81-31207

AERODYNAMIC STABILITY
Dynamic Stability Parameters --- conferences [AGARD-LS-114] N81-31105
Aerodynamic mathematical modeling - basic concepts N81-31106
Impact of high-alpha aerodynamics on dynamic stability parameters of aircraft and missiles N81-31107
Review of techniques for determination of dynamic stability parameters in wind tunnels N81-31108
Direct forced-oscillation techniques for the determination of stability derivatives in wind tunnels N81-31109
Wind-tunnel measurement of aerodynamic derivatives using flexible-sting rigs N81-31110
Rotary and Magnus balances N81-31111
Curved-flow, rolling-flow, and oscillatory pure-yawing wind-tunnel test methods for determination of dynamic stability derivatives N81-31112
Support interference N81-31113
Applications of half-model technique in dynamic stability testing N81-31114
Preliminary results of buffet tests in a cryogenic wind tunnel --- conducted in Langley 0.3 m transonic cryogenic tunnel [NASA-TM-81923] N81-31124
Transition and conversion trim-maps for the AV-8A VTOL aircraft [AD-A102155] N81-31188
Generalized dynamic stability for linearized yawing motion --- The stability of spinning projectiles [RMCS-80002] N81-31225
Aeroelastic instability stoppers for wind-tunnel models [NASA-CASE-LAR-12720-1] N81-31229

AERODYNAMIC STALLING
Stall flutter experiment in a transonic oscillating linear cascade [NASA-TM-82655] N81-31126
Unsteady airloads on oscillating wings in post-stall condition [DFVLR-FB-81-16] N81-31158

AERODYNAMICS
Aeronautical Engineering: A continuing bibliography with indexes, supplement 137, July 1981 [NASA-SP-7037(137)] N81-31103

AEROELASTICITY
Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118
Stall flutter experiment in a transonic oscillating linear cascade [NASA-TM-82655] N81-31126
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
Aeroelastic buffeting prediction techniques: A general review [DFVLR-FB-81-15] N81-31226
Aeroelastic instability stoppers for wind-tunnel models [NASA-CASE-LAR-12720-1] N81-31229
Aeroelastic instability stoppers for wind-tunnel models [NASA-CASE-LAR-12458-1] N81-31230
General review of the MOSTAS computer code for wind turbines [NASA-CR-165385] N81-31628
Aeroelastic analysis of a troposkien-type wind turbine blade [NASA-CR-165764] N81-31629

AERONAUTICAL ENGINEERING
Aeronautical Engineering: A continuing bibliography with indexes, supplement 137, July 1981 [NASA-SP-7037(137)] N81-31103

AERONAUTICS
Activities report on aerospace and energy research N81-31672
Sixth advanced operational aviation medicine course [AGARD-R-681] N81-31827

AEROSOLS
Measurements of the size distribution and solubility of Salty Dog pyrotechnic [AD-A102547] N81-31388
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506
Satellite measurements of tropospheric aerosols [NASA-CR-3459] N81-31680
Dispersion of radioactive pollutant in a tornadic storm [DP-1556] N81-31687
Estimated contributions of Swedish and outside sources to background aerosol concentrations in Sweden [CM-50] N81-31688
The measurement and identification of ultrafine aerosols in polluted air [PB81-198673] N81-31703
Eleven-year solar cycle influence on atmospheric exchanges in the Antarctica --- lead isotopes in aerosols N81-31766
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts [PB81-198293] N81-31797
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988

AEROSPACE ENGINEERING
Scientific report of the Research Department for Fluid Dynamics N81-31520
Activities report on aerospace and energy research N81-31672

AEROSPACE ENVIRONMENTS
Performing experiments under space flight conditions in the domain of chemical engineering N81-31245

AEROSPACE INDUSTRY
SNIAS and the world market for application satellites --- television and communication satellites [SNIAS-802-422-106] N81-31270

AEROSPACE MEDICINE
Aerospace Medicine and Biology: A continuing bibliography with indexes [NASA-SP-7011(222)] N81-31816

AEROSPACE TECHNOLOGY TRANSFER
Space Benefits: The secondary application of aerospace technology in other sectors of the economy [NASA-CR-164733] N81-32086

AFTERBODIES
Propeller propulsion integrataion, phase 2 [NASA-CR-164730] N81-31125

AGGREGATES
The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry [PB81-200073] N81-31408

AGING (BIOLOGY)
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469

AGING (MATERIALS)
Aging characteristics of the SA1773 ceramic capacitor [SAND-80-1132] N81-31374

AGRICULTURE
Meteorological satellite data: A tool to describe the health of the world's agriculture [E81-10204] N81-31596
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979 [PB81-186751] N81-31614

AGROMETEOROLOGY
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment [E81-10208] N81-31599

AIR CONDITIONING
Nonresidential building energy consumption survey [DOE/EIA-0288] N81-31642
Salt-hydrate thermal-energy-storage system for space heating and air conditioning [DOE/CS-34698/T1] N81-31669

AIR FILTERS
Filter media for collecting diesel particulate matter [PB81-197774] N81-31695

AIR FLOW
Combustion in high speed air flows [AD-A102336] N81-31320
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method [UCRL-85226] N81-31517

AIR POLLUTION
Atmospheric measurements of selected hazardous organic chemicals [PB81-200628] N81-31328
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method [UCRL-85226] N81-31517
Hierarchical set of models for estimating the effects of air pollution on vegetation [UCRL-85367] N81-31682
Modeling and analysis of air-quality data [DOE/EV-10428/8] N81-31686
Dispersion of radioactive pollutant in a tornadic storm [DP-1556] N81-31687
Estimated contributions of Swedish and outside sources to background aerosol concentrations in Sweden [CM-50] N81-31688
Development of measurement methodology for, evaluating fugitive particulate emissions [PB81-196594] N81-31690
Environmental perspective on the emerging oil shale industry. Volume 2: Appendices [PB81-196602] N81-31691
Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7 [PB81-196628] N81-31692
Evaluation of emissions and control technology for industrial stoker boilers [PB81-197873] N81-31696
Guideline for applying the the Airshed Model to urban areas [PB8 ; -200529] N81-31699
Controlling sulfur oxides [PB81-200800] N81-31700
The measurement and identification of ultrafine aerosols in polluted air [PB81-198673] N81-31703
Guideline for fluid modeling of atmospheric diffusion [PB81-201410] N81-31739
Evaluation of Texas Air Control Board management and operations systems requirements. Part 1: Identification of TACB, phase 1 [PB81-180945] N81-32078
Evaluation of Texas Air Control Board management and operations systems requirements. Part 2: Appendices to the part 1 report, phase 2 [PB81-180952] N81-32079

AIR QUALITY
Atmospheric measurements of selected hazardous organic chemicals [PB81-200628] N81-31328
District heating: Air-quality considerations and the Clean Air Act [BNL-51361] N81-31683
Modeling and analysis of air-quality data [DOE/EV-10428/8] N81-31686

Environmental perspective on the emerging oil shale industry. Volume 2: Appendices
[PB81-196602] N81-31691
Evaluation of emissions and control technology for industrial stoker boilers
[PB81-197873] N81-31696
Evaluation of maintenance for fugitive VOC emission control
[PB81-206005] N81-31702

AIR SAMPLING
CF6-50 engine emissions testing with traverse probe
[AD-A102159] N81-31218

AIR TO AIR REFUELING
NTF and the Department of Defense N81-31133

AIR TRAFFIC CONTROL
Information transfer in the surface component of the system: Problems associated with briefing of relief controllers N81-31164
Information transfer in the surface component of the system: Coordination problems in air traffic control N81-31165
Information transfer between air traffic control and aircraft: Communication problems in flight operations N81-31166
The information transfer problem summary and comments N81-31169
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test
[NASA-CR-3461-VOL-1] N81-31171
NAS automation equipment operating cost estimates, FY 1978 - 1979
[AD-A102023] N81-31182
Proceedings of the Public Workshop on Alternative Separation Concepts: Presentations, Discussions and Recommendations
[AD-A102519] N81-31183
Dissemination of weather information in the air traffic control system
[AD-A102027] N81-31787

AIR TRAFFIC CONTROLLERS (PERSONNEL)
Dissemination of weather information in the air traffic control system
[AD-A102027] N81-31787

AIR TRANSPORTATION
Predicting the impacts of new technology aircraft on international air transportation demand
[NASA-CR-165654] N81-31160
Airport and airway system development act of 1981
[GPO-75-804] N81-31231
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236

AIR WATER INTERACTIONS
A higher order theory for the potential flow about thin hydrofoils N81-31502
Numerical simulation of mesoscale atmospheric circulations over the Lake Michigan area
[CONF-801102-38] N81-31790

AIRBORNE EQUIPMENT
Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180
MLS antenna locations for the deHaviland DASH 7 aircraft
[NASA-TM-83195] N81-31418

AIRBORNE/SPACEBORNE COMPUTERS
Review of AIDS development --- airborne computers for reliability engineering N81-31212

AIRCRAFT
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128

AIRCRAFT ANTENNAS
MLS antenna locations for the deHaviland DASH 7 aircraft
[NASA-TM-83195] N81-31418

AIRCRAFT APPROACH SPACING
Proceedings of the Public Workshop on Alternative Separation Concepts: Presentations, Discussions and Recommendations
[AD-A102519] N81-31183

AIRCRAFT COMMUNICATION
Aural communication in aviation
[AGARD-CP-311] N81-31449
Voice communication research and evaluation system N81-31450
Electronic voice communications improvements for Army aircraft N81-31454
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469
An active noise reduction system for aircrew helmets N81-31470
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474
Sidetone-level considerations in aircraft communication systems N81-31475

AIRCRAFT CONFIGURATIONS
Configuration aerodynamics N81-31148

AIRCRAFT CONSTRUCTION MATERIALS
Conservation of Strategic Aerospace Materials (COSAM) N81-31208

AIRCRAFT CONTROL
Control derivatives N81-31119
A model-following technique for insensitive aircraft control systems N81-31223
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452

AIRCRAFT DESIGN
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane
[NASA-CR-165768] N81-31184
Vehicle concepts and technology requirements for buoyant heavy-lift systems
[NASA-TP-1921] N81-31185

AIRCRAFT DETECTION
Modeling the effects of sustained accelerations on pilot tracking performance N81-31839

AIRCRAFT ENGINES
Fiber optics for aircraft engine/inlet control
[NASA-TM-82654] N81-31190
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
CF 6 engine diagnostics N81-31197
CF6 high pressure compressor and turbine clearance evaluations N81-31198
JT9D jet engine diagnostics program N81-31199
JT8D engine performance retention N81-31200
Performance retention of the RB211 powerplant in service N81-31201
Performance deterioration: An airline perspective N81-31202
The nature of operating flight loads and their effect on propulsion system structures N81-31207
Conservation of Strategic Aerospace Materials (COSAM) N81-31208
Engine condition monitoring: CF6 family 60's through the 80's N81-31215
An overview of SAE ARP 1587: Aircraft gas turbine engine monitoring system guide N81-31217

AIRCRAFT EQUIPMENT
High speed multiplex bus protocol study
[AD-A102113] N81-31191

AIRCRAFT FUELS
A United Kingdom view on future fuels
[PNR-90068] N81-31398

AIRCRAFT GUIDANCE
Proceedings of the Public Workshop on Alternative Separation Concepts: Presentations, Discussions and Recommendations
[AD-A102519] N81-31183

AIRCRAFT LANDING
Terminal area automatic navigation, guidance, and control 1: Automatic rollout, turnoff, and taxis
[NASA-CR-3451] N81-31224
Structural response methods and evaluation results for helicopter landing decks on 210- and 270-foot USCCG cutters
[AD-A102420] N81-31233

AIRCRAFT MAINTENANCE
Actual versus simulated equipment for aircraft maintenance training: Cost implications of the incremental versus the unique device
[AD-A102388] N81-31104

AIRCRAFT MANEUVERS
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980
[AD-A102495] N81-31187
Transition and conversion trim-maps for the AV-8A VTOL aircraft
[AD-A102155] N81-31188

AIRCRAFT NOISE
Minimum noise impact aircraft trajectories
[NASA-CR-164719] N81-31159
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
An automated multiple choice intelligibility testing system N81-31468
Flying helmet attenuation, and the measurement, with particular reference to the Mk 4 helmet N81-31473

AIRCRAFT PERFORMANCE
Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane
[NASA-CR-165768] N81-31184

AIRCRAFT PILOTS
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469
Hearing impaired aviators in the U.S. Army N81-31471
Pilot interaction with automated airborne decision making systems
[NASA-CR-164729] N81-31847

AIRCRAFT RELIABILITY
Factors of safety related to structural integrity. A review of data from military airworthiness authorities
[AGARD-R-677] N81-31186

AIRCRAFT SAFETY
The information transfer problem summary and comments N81-31169
Factors of safety related to structural integrity. A review of data from military airworthiness authorities
[AGARD-R-677] N81-31186

AIRCRAFT STABILITY
Dynamic Stability Parameters --- conferences
[AGARD-LS-114] N81-31105
Aerodynamic mathematical modeling - basic concepts N81-31106
Impact of high-alpha aerodynamics on dynamic stability parameters of aircraft and missiles N81-31107
Review of techniques for determination of dynamic stability parameters in wind tunnels N81-31108
Wind-tunnel measurement of aerodynamic derivatives using flexible-sting rigs N81-31110
Rotary and Magnus balances N81-31111
Curved-flow, rolling-flow, and oscillatory pure-yawing wind-tunnel test methods for determination of dynamic stability derivatives N81-31112
Applications of half-model technique in dynamic stability testing N81-31114
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
Estimation of dynamic stability parameters from drop model flight tests N81-31116
Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120

AIRCRAFT STRUCTURES
Damage tolerance of a landing gear component after many takeoffs and landings --- nondestructive tests
[NLR-MP-79039-U] N81-31189

AIRFOIL PROFILES
Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136

AIRFOILS
Some applications of aerodynamic formulations to problems in aircraft dynamics N81-31121
High lift technology N81-31147
Automated Plasma Spray (APS) process feasibility study
[NASA-CR-165418] N81-31193
Improving turbine engine compressor performance retention through airfoil coatings N81-31203

AIRLINE OPERATIONS
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236

AIRPORT PLANNING
Airport and airway system development act of 1981
[GPO-75-804] N81-31231
AIRPORTS
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236
Presentation to the European Union against Aircraft Nuisances --- jet noise reduction, airports
[PNR-90064] N81-31959
AIRSHIPS
Vehicle concepts and technology requirements for buoyant heavy-lift systems
[NASA-TP-1921] N81-31185
ALASKA
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
Geohydrology of the Delta-Clearwater Alaska
[PB81-200651] N81-31621
Carbon dioxide, condensation nuclei and wind climatology of the Barrow GMCC Observatory (1973-1979)
[PB81-198715] N81-31800
ALGORITHMS
On solving the large sparse generalized eigenvalue problem N81-31859
Almost sure convergence of adaptive identification prediction and control algorithms
[AD-A102041] N81-31905
Research on numerical algorithms for large space structures
[NASA-CR-164721] N81-31911
An adaptive ARMA spectral estimator, part 1
[AD-A101869] N81-31927
Problems in optimal filtering and stochastic control
[AD-A102478] N81-31929
An algorithm for isotonic regression in the plane
[AD-A102559] N81-31935
Computationally fast algorithms for ARMA spectral estimation
[AD-A102489] N81-31941
An adaptive ARMA spectral estimator, part 2
[AD-A101870] N81-31949
ALIGNMENT
Inertial system alignment and calibration on a moving base N81-31178
ALKALINE EARTH METALS
Salt-hydrate thermal-energy-storage system for space heating and air conditioning
[DOE/CS-34698/T1] N81-31669
ALKANES
Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379
ALKENES
Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379
Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380
ALLOYS
Electron spin resonance in amorphous alloys N81-32057
ALPHA PARTICLES
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031
ALTERNATING CURRENT
Automatic test system for CCDS
[UCID-19077] N81-31489
ALUMINUM
RSV for aluminum
[FOA-C-20348-D4] N81-31341
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021
Laser heating of aluminum exploding wire plasmas N81-32022
ALUMINUM ALLOYS
Effect of production conditions on physical and mechanical properties of aluminum with low iron concentrates N81-31330
Development of fracture toughness measurement capability by ultrasound
[BDX-613-2625] N81-31586
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity
[NLR-TR-79121-U] N81-31589
ALUMINUM BOROHYDRIDES
Fillers for improved graphite fiber retention by polymer matrix composites
[NASA-CR-165437] N81-31288
ALUMINUM OXIDES
Trapping of discrete phases at solidification fronts --- space experiment supporting theory N81-31252
Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318
Delayed failure characteristics of plasma-sprayed aluminum oxide applied to stainless steel and titanium alloy substrates in various physiological media N81-31332
Structure and properties of polymers and organosilanes absorbed onto oxidized aluminum and titanium
[AD-A102365] N81-31370
Thermal diffusivities of molybdenum/alumina cermets
[GEPP-TIS-472] N81-31375
AMBIPOLAR DIFFUSION
Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
AMMONIA
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307
Time resolved UV-spectroscopy of NH3 molecules vibrationally excited by CO2 laser radiation
[PLF-31] N81-31543
AMMONIUM SULFATES
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988
AMORPHOUS MATERIALS
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017
Electron spin resonance in amorphous alloys N81-32057
AMPLIFICATION
Fiber optic transceiver design
[AD-A102362] N81-31425
Development of X-ray laser media: Measurement of gain and development of cavity resonators for wavelengths near 130 Angstroms
[AD-A102335] N81-31539
AMPLITUDE MODULATION
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481
AMPLITUDES
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411
ANALOGIES
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics
[FOA-C-53004-H9] N81-31845
ANALYSIS OF VARIANCE
Selection procedures for a problem in analysis of variance
[AD-A101922] N81-31931
ANGINA PECTORIS
Prevention of cardiovascular diseases N81-31836
ANGLE OF ATTACK
Estimation of dynamic stability parameters from drop model flight tests N81-31116
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154
ANGULAR RESOLUTION
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528
ANIONS
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
ANOMALIES
Principal electrocardiographic anomalies in the evaluation of navigation personnel N81-31832
ANTARCTIC REGIONS
Ice sheet altimetry
[NASA-CR-156877] N81-31605
ANTENNA ARRAYS
The effect of a pulsed interference signal on an adaptive array
[AD-A102258] N81-31430
ANTENNA COMPONENTS
Dynamic response of tuned secondary systems N81-31567
ANTENNA DESIGN
The collinear coaxial array antenna
[RSRE-MEMO-3350] N81-31444
ANTENNA FEEDS
Unequal split microwave power divider
[NASA-CASE-LAR-12889-1] N81-31483
ANTENNAS
Moment method solutions for radiation and scattering from arbitrarily shaped surfaces N81-31416
ANTIPARTICLES
Quark-antiquark potential and quantum chromodynamics
[FERMILAB-CONF-81/38-THY] N81-31969
APPLICATIONS OF MATHEMATICS
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 3: The measurement model
[DOE/TIC-1022361] N81-31648
APPROPRIATIONS
Airport and airway system development act of 1981
[GPO-75-804] N81-31231
AQUEOUS SOLUTIONS
Photoelectron emission spectroscopy of aqueous solutions
[AD-A102426] N81-31313
Sulfur dioxide oxidation reactions in aqueous solutions
[PB81-196834] N81-31738
AQUICULTURE
Energy from open ocean kelp farms
[GPO-51-285] N81-31383
AQUIFERS
Geohydrology of the Delta-Clearwater Alaska
[PB81-200651] N81-31621
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622
ARC HEATING
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354
ARCHITECTURE
Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625
ARCHITECTURE (COMPUTERS)
The design methodology of distributed computer systems
[AD-A102065] N81-31864
Advanced multiple processor configuration study
[AD-A101919] N81-31868
Bulk-memory processor for data acquisition
[LA-UR-81-1568] N81-31869
Cellular architectures: From automata to hardware --- image processing
[AD-A102059] N81-31907
ARCTIC REGIONS
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
ARIZONA
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
ARRAYS
The equivalence of linearly constrained optimum array weight vectors under different optimization criteria
[AD-A102323] N81-31434
ARRHYTHMIA
Cardiovascular problems during the pilots career N81-31837
ARTIFICIAL INTELLIGENCE
Word Expert Parsing: A theory of distributed word-based natural language understanding N81-31876

Cursive script word recognition N81-31878
Computing with connections --- computer modeling of animal brains: vision
[AD-A102221] N81-31885

ASBESTOS
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817

ASPHALT
Asphaltic concrete overlays of rigid and flexible pavements
[PB81-197394] N81-31407

ASSEMBLER ROUTINES
Construction of integer-vector library routines for the CRAY computer
[SAND-81-8214] N81-32075

ASSEMBLING
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting
[NASA-TM-82429] N81-31402

ASSEMBLY LANGUAGE
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904

ASTRONOMICAL SPECTROSCOPY
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099

ASYMPTOTIC METHODS
Boundary layers with strong interaction: From asymptotic theory to calculation method
[NLR-MP-80015-U] N81-31524
Asymptotic (beta) subd joint normality of sample quantiles
[AD-A101991] N81-31934

ATLANTIC OCEAN
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803

ATMOSPHERIC ATTENUATION
The ROSCOE MANUAL. Volume 27: Natural background radiation
[AD-A102524] N81-32016

ATMOSPHERIC BOUNDARY LAYER
Dynamics of the atmospheric boundary layer during the 1980 total solar eclipse
[BNL-29497] N81-31729
Guideline for fluid modeling of atmospheric diffusion
[PB81-201410] N81-31739

ATMOSPHERIC CHEMISTRY
Modeling and analysis of air-quality data
[DOE/EV-10428/8] N81-31686

ATMOSPHERIC CIRCULATION
Accommodations assessment: Spaceborne Doppler lidar wind measuring system
[NASA-TM-82435] N81-31744
The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin --- pressure variations, magnetic storms N81-31760
Possible influence of solar rotation on tropospheric circulation N81-31762
Formation of the Earth and alteration of the climate N81-31773
Numerical simulation of mesoscale atmospheric circulations over the Lake Michigan area
[CONF-801102-38] N81-31790
Tropical cyclones (1980): Central Pacific
[PB81-198699] N81-31799
Carbon dioxide, condensation nuclei and wind climatology of the Barrow GMCC Observatory (1973-1979)
[PB81-198715] N81-31800

ATMOSPHERIC COMPOSITION
Atmospheric measurements of selected hazardous organic chemicals
[PB81-200628] N81-31328
The changing atmosphere: Its role in climate --- biological aspects N81-31776
Remote atmospheric measurments with a tunable infrared laser source --- pollution monitoring N81-31985

ATMOSPHERIC DIFFUSION
Guideline for fluid modeling of atmospheric diffusion
[PB81-201410] N81-31739

ATMOSPHERIC MODELS
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method
[UCRL-85226] N81-31517
Guideline for applying the the Airshed Model to urban areas
[PB81-200529] N81-31699
Fluctuations, solar periodicities, and climatic transitions --- climate modeling N81-31777
The ROSCOE MANUAL. Volume 27: Natural background radiation
[AD-A102524] N81-32016
The ionosphere of Saturn N81-32104

ATMOSPHERIC MOISTURE
Maui optical site, Mount Halekualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F
[AD-A102394] N81-31788
Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789

ATMOSPHERIC PRESSURE
The 200, 22 and 11 year cycles and long series of climatic data, mainly since 200 AD --- atmospheric pressure N81-31757

ATMOSPHERIC TEMPERATURE
ADS report number 4 --- oceanographic and meteorological conditions in the North Pacific
[AD-A102111] N81-31592
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
Temperature variability and the 22 year solar cycle N81-31753
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775

ATMOSPHERIC TURBULENCE
Investigation of turbulence according to fluctuating radio reflections --- meteor trails, atmospheric turbulence
[PNR-90063] N81-31793

ATOMIC STRUCTURE
An LCAO local density functional approach to surface electronic structure calculations --- thin films N81-32048
Theoretical calculations of the electronic and vibrational structure of point defects in ionic crystals
[CONF-810573-1(DRAFT)] N81-32067

ATTRACTION
Casimir self-stress on a perfectly conducting cylindrical shell
[DOE/ER-01545-308] N81-31584

AUDIO EQUIPMENT
Voice communication capability of selected inflight headgear devices N81-31467

AUDIO FREQUENCIES
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
Some applications of the STI-method in evaluating speech transmission channels N81-31466

AUDIOMETRY
The effect of noise on the vestibular system N81-31455
Hearing conservation N81-31472

AUDITORY DEFECTS
The effect of noise on the vestibular system N81-31455
The effect of noise-induced hearing loss on the intelligibility of speech in noise N81-31460
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469
Hearing impaired aviators in the U.S. Army N81-31471

AUDITORY PERCEPTION
Aural communication in aviation
[AGARD-CP-311] N81-31449
Voice communications jamming research N81-31451
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459

AUDITORY SIGNALS
Aural communication in aviation
[AGARD-CP-311] N81-31449
The speed of response to synthesized voice messages N81-31456
Assessing the effectiveness of auditory warnings N81-31457
Voice warning systems: Some experimental evidence concerning application N81-31458

AURORAS
Double layers in the laboratory and above the aurora --- plasma layers
[TRITA-EPP-80-12] N81-31735

AUSTRALIA
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809

AUTOMATA THEORY
Cellular architectures: From automata to hardware --- image processing
[AD-A102059] N81-31907

AUTOMATIC CONTROL
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test
[NASA-CR-3461-VOL-1] N81-31171
Terminal area automatic navigation, guidance, and control 1: Automatic rollout, turnoff, and taxis
[NASA-CR-3451] N81-31224
Pilot interaction with automated airborne decision making systems
[NASA-CR-164729] N81-31847
A small operating system for real-time runs on a Nord-10
[FOA-C-20336-E3] N81-31900
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952

AUTOMATIC FLIGHT CONTROL
Basic research in digital stochastic model algorithmic control
[AD-A102145] N81-31909

AUTOMATIC TEST EQUIPMENT
Automatic test system for CCDS
[UCID-19077] N81-31489

AUTOMATION
Generalization within automated cartographic systems
[RS-07-UT(3)] N81-31612

AUTOMOBILE ENGINES
Review of alternate automotive engine fuel economy
[PB81-186652] N81-31555
High-power baseline and motoring test results for the GPU-3 Stirling engine
[NASA-TM-82646] N81-32087
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile
[NASA-CR-165281] N81-32088

AUTOMOBILE FUELS
Impact of gasohol on automobile evaporative and tailpipe emissions
[PB81-199952] N81-31400
Review of alternate automotive engine fuel economy
[PB81-186652] N81-31555
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089

AUTOMOBILES
Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299
Dynamometer and track measurement of passenger car fuel economy
[PB81-196446] N81-32092

AUXILIARY POWER SOURCES
Electrochemical energy storage subsystems study, volume 2
[NASA-CR-165420-VOL-2] N81-31631

AVIONICS
High speed multiplex bus protocol study
[AD-A102113] N81-31191
Electronic voice communications improvements for Army aircraft N81-31454

AXIAL FLOW TURBINES
Aeroelastic analysis of a troposkien-type wind turbine blade
[NASA-CR-165764] N81-31629

AXISYMMETRIC BODIES
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method
[SNIAS-802-422-104] N81-31296

B

BACKGROUND NOISE
Voice communications jamming research N81-31451
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602
BACKGROUND RADIATION
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
[NASA-CR-164724] N81-31719
The ROSCOE MANUAL. Volume 27: Natural background radiation
[AD-A102524] N81-32016
BACKSCATTERING
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988
BACTERIOPHAGES
Membrane-membrane interactions in a lipid-containing bacteriophage system
[DOE/EV-03211/32] N81-31813
BALL BEARINGS
Ball bearing mechanics
[NASA-TM-81691] N81-31550
BALLISTICS
Electromagnetic theta gun and tubular projectiles
[SAND-80-1988] N81-31490
BALLOON SOUNDING
Wind measurements by parachute
[FOA-C-20344-D2] N81-31748
BALLOON-BORNE INSTRUMENTS
SCRIBE 1 data analysis
[AD-A102262] N81-31315
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113
BAND STRUCTURE OF SOLIDS
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017
Metallic hydrogen: A two-body approach to band theory and a quantum mechanical test of Diophantine methods N81-32055
Electronic structure of solids and their surfaces and interfaces
[AD-A101945] N81-32062
BARIUM TITANATES
Recoilless Rayleigh scattering from pure single crystals of Barium titanate near the 130 deg C ferroelectric Curie point N81-32051
BARLEY
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599
BAROCLINIC WAVES
Normal mode global Rossby waves: Theory and observations N81-31704
A numerical model study of long-term planetary wave predictability N81-31710
BARRIERS (LANDFORMS)
Barrier Island development near four National seashores
[PB81-196313] N81-31804
BASES (CHEMICAL)
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285
BAUSCHINGER EFFECT
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
BAYES THEOREM
Sequential decision rules for failure detection
[NASA-CR-164847] N81-31559
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates
[AD-A102413] N81-31040
BEACON COLLISION AVOIDANCE SYSTEM
Active beacon collision avoidance logic evaluation. Volume 1: Mode C equipped (ATCRBS) threat phase
[AD-A102163] N81-31181
BEAM INJECTION
Neutral-beam injectors for 1990 and 2005
[UCRL-53112] N81-31978
BEAMS (RADIATION)
Change in reflectivity of metals under intense laser radiation, revision
[AD-A102005] N81-31342
Optimum beamforming subject to multiple linear constraints
[AD-A102322] N81-31435
Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633
BENARD CELLS
Application of the Space Optics Laboratory in the specific case of Benard cell convection N81-31997
BENDING
Plate bending finite element based on the extended field method N81-31573
BERYLLIUM 10
Beryllium-10 as a potential probe of solar variability influence on climate N81-31772
BESSEL FUNCTIONS
Table of the modified Bessel functions of orders zero and one together with the function phi(z)=(21sub1)(z)/(zlsub0)(z) and its reciprocal for complex argument
[AD-A102444] N81-31912
BIAS
Shrinkage in principal components with applications to factor analysis N81-31922
BIBLIOGRAPHIES
Aeronautical Engineering: A continuing bibliography with indexes, supplement 137, July 1981
[NASA-SP-7037(137)] N81-31103
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[NASA-SP-7011(222)] N81-31816
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[TRITA-EPP-80-13] N81-32042
NASA Tech Briefs Index, 1980, vol. 5 nos. 1-4 --- bibliography
[NASA-SP-5021(22)] N81-32085
BICRYSTALS
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052
Dynamics of a finite square bicrystal lattice with a linear interface N81-32059
BINARY FLUIDS
Demonstration of the separation behavior of alloys using transparent model systems --- for zero gravity application N81-31253
BINARY MIXTURES
Kinetics of phase separation in fluid mixtures --- influence of weightlessness N81-31248
BINARY SYSTEMS (MATERIALS)
Trapping of discrete phases at solidification fronts --- space experiment supporting theory N81-31252
Concentration profiles in front of solidification fronts --- crystal growth N81-31254
BIOCHEMISTRY
Radiation biophysics research
[LBL-11700] N81-31811
BIOCONVERSION
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
BIOGEOCHEMISTRY
Changing global biogeochemistry --- man-induced changes
[CM-52] N81-31689
BIOLOGICAL EFFECTS
Changing global biogeochemistry --- man-induced changes
[CM-52] N81-31689
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels
[DOE/EV-10503/1] N81-31815
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(222)] N81-31816
BIOLOGICAL MODELS (MATHEMATICS)
Changing global biogeochemistry --- man-induced changes
[CM-52] N81-31689
BIOMASS ENERGY PRODUCTION
Energy from open ocean kelp farms
[GPO-51-285] N81-31383
Alcohol fuels
[GPO-70-454] N81-31384
Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636
Florida's renewable energy potential
[GPO-68-757] N81-31637
BIONICS
BIOCONAID system (bionic control of acceleration induced dimming)
[AD-A102510] N81-31234
BIOPHYSICS
Radiation biophysics research
[LBL-11700] N81-31811
In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819
BIOREACTORS
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
Biological reduction of nitrate wastewater using fluidized-bed bioreactors
[CONF-810554-2] N81-31812
BIVARIATE ANALYSIS
Theory for coloring bivariate statistical maps
[DOE/EV-10428/9] N81-31610
Computation of the integral of the bivariate normal distribution over arbitrary polygons
[AD-A102466] N81-31928
BLADE TIPS
Advanced turbine blade tip seal system N81-31205
BLAST LOADS
Blast-resistant capacities of cold-formed steel panels
[AD-A101915] N81-31343
Detonation characteristics of dust dispersed in air
[AD-A102507] N81-31387
BLUFF BODIES
Propeller propulsion integrataion, phase 2
[NASA-CR-164730] N81-31125
BLURRING
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics
[FOA-C-53004-H9] N81-31845
BODY TEMPERATURE
Comparison between the heat loss and heat gain through the lungs and body surface during hypothermia and its treatment
[DRIC-T-6307] N81-31825
BODY-WING CONFIGURATIONS
Three-dimensional transonic flow analysis
[AD-A101944] N81-31153
BOILERS
Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7
[PB81-196628] N81-31692
Evaluation of emissions and control technology for industrial stoker boilers
[PB81-197873] N81-31696
BOILING WATER REACTORS
Corrosion and stress corrosion cracking of type 304 stainless steel and carbon steel in simulated boiling water reactor N81-31336
BOLIVIA
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
BORN-OPPENHEIMER APPROXIMATION
Monte Carlo calculation of the Born-Oppenheimer potential between two helium atoms N81-31960

BORON
Fillers for improved graphite fiber retention by polymer matrix composites
[NASA-CR-165437] N81-31288
BORON CARBIDES
Fillers for improved graphite fiber retention by polymer matrix composites
[NASA-CR-165437] N81-31288
BORON ISOTOPES
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113
BORON REINFORCED MATERIALS
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
BOROSILICATE GLASS
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307
BOUNDARIES
Large deviations for boundary crossing probabilities
[AD-A102142] N81-31947
BOUNDARY LAYER FLOW
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128
High Reynolds number research - 1980
[NASA-CP-2183] N81-31130
Gortler vortices and transition in wall boundary layers of two Mach 5 nozzles
[NASA-TP-1869] N81-31509
Turbulent boundary layer flow through a gap in a wall-mounted roughness element
[AD-A102324] N81-31516
BOUNDARY LAYER TRANSITION
The NTF as a national facility N81-31132
Dynamics of the atmospheric boundary layer during the 1980 total solar eclipse
[BNL-29497] N81-31729
BOUNDARY LAYERS
Measurement of the boundary layer adherent to the electrodes of an electrolytic cell --- under reduced gravity N81-32006
BOUNDARY VALUE PROBLEMS
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154
Stress-assisted diffusion and consolidation with double porosity N81-31561
An algorithm for evaluating the boundary integral equations in planar elasto-plastic bodies N81-31574
Compact deferred correction formulas
[TRITA-NA-8007] N81-31918
BRAIN
Computing with connections --- computer modeling of animal brains: vision
[AD-A102221] N81-31885
BREADBOARD MODELS
Results of the ETV-1 breadboard tests under steady-state and transient conditions --- conducted in the NASA-LeRC Road Load Simulator
[NASA-TM-82667] N81-31627
BRINES
Polyacrylamide polymer viscosity as a function of brine composition
[DOE/BETC/RI-80/12] N81-31373
BRITTLE MATERIALS
The continuous damage theory of brittle materials and its applications in plane problems N81-31575
BUBBLES
Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Gas bubble formation in electrolytes under reduced gravity N81-31249
BUFFER STORAGE
Gas-discharge matrix display --- with inherent memory
[BMFT-FB-T-80-082] N81-31492
BUFFETING
Preliminary results of buffet tests in a cryogenic wind tunnel --- conducted in Langley 0.3 m transonic cryogenic tunnel
[NASA-TM-81923] N81-31124
Aeroelastic buffeting prediction techniques: A general review
[DFVLR-FB-81-15] N81-31226
BUMPY TORUSES
Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
BUOYANCY
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503
BUOYS
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment
[PB81-198939] N81-31807

C

CADMIUM SELENIDES
Investigation of photoelectrochemical corrosion of semiconductors
[SERI/TR-8002-6-T1] N81-31347
CADMIUM TELLURIDES
Solvent zone crystallization of CdTe in a mirror heating facility --- orientation experiments for space manufacturing N81-31256
CALCULATORS
An introduction to a reliability shorthand
[AD-A102372] N81-31558
CALIBRATING
Inertial system alignment and calibration on a moving base N81-31178
The effects of gender and instructions on calibration
[AD-A102255] N81-31844
CALIFORNIA
Resource assessment of low- and moderate-temperature geothermal waters in Calistoga, Napa County, California. Report of the second year, 1979 to 1980 of the US Department of Energy - California State-Coupled Program for reservoir assessment and confirmation
[DOE/ET-27035/T1] N81-31609
CANCER
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817
Toward a theory of the initiation of cancer by ionizing radiation: Track structure analysis for electrons and alpha particles in water
[CONF-800944-8] N81-31821
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
CANONICAL FORMS
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487
CAPACITORS
Aging characteristics of the SA1773 ceramic capacitor
[SAND-80-1132] N81-31374
Development of a 600 kV Marx module for a high-density z-pinch experiment
[LA-UR-81-1584] N81-32033
CARBON
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021
CARBON COMPOUNDS
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713
CARBON DIOXIDE
CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662
A spectrum of carbon dioxide from 800 to 5500 cm-1
[NASA-CR-164720] N81-31717
Carbon dioxide, condensation nuclei and wind climatology of the Barrow GMCC Observatory (1973-1979)
[PB81-198715] N81-31800
CARBON DIOXIDE LASERS
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535
Time resolved UV-spectroscopy of NH3 molecules vibrationally excited by CO2 laser radiation
[PLF-31] N81-31543
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988
Nanosecond CO2 laser interaction with a dense helium Z-pinch plasma N81-32024
CARBON FIBER REINFORCED PLASTICS
Investigation of the breakdown of carbon fiber electrical resistance of the resulting small particles
[FOA-C-20349-F9] N81-31291
Graphite reinforced thermoplastic composites
[AD-A102217] N81-31292
CARBON FIBERS
Hybridized polymer matrix composites
[NASA-CR-165339] N81-31361
CARBON MONOXIDE
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396
CARBON MONOXIDE LASERS
Measurements of the CO laser characteristics by medium modulation N81-31534
CARBON 13
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113
CARBON 14
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771
CARBON-CARBON COMPOSITES
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method
[SNIAS-802-422-104] N81-31296
CARBONATES
Lignite combustion test project summary report
[DOE/FC-02030/T1] N81-31323
CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645
CARCINOGENS
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
CARDIOGRAMS
The application of cardiograms in the valuation of navigation personnel N81-31830
CARDIOGRAPHY
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
NATO regulations on the cardio-vascular system N81-31829
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
CARDIOLOGY
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
CARDIOVASCULAR SYSTEM
NATO regulations on the cardio-vascular system N81-31829
CARGO AIRCRAFT
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236
CARRIER FREQUENCIES
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411
CARRIER WAVES
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411
CARTRIDGES
Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537
CASCADE CONTROL
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952

CASCADE FLOW
Stall flutter experiment in a transonic oscillating linear cascade
[NASA-TM-82655] N81-31126
CASE HISTORIES
Case studies in computer control --- process control
[RR-145] N81-31910
CAST ALLOYS
Factors affecting graphite morphology, matrix structure and tensile properties of compacted graphite cast irons N81-31331
CASTING
Progress in the battle with the burr
[BDX-613-2306] N81-31552
CATALYSTS
Photoegeneration of reactive organometallic species
[AD-A102069] N81-31286
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases
[DOE/ET-14809/6] N81-31322
Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379
Nuclear magnetic resonance of platinum catalysts: The discovery of the surface resonance N81-32045
CATALYTIC ACTIVITY
Photochemistry of surface-confined organometallics: Photochemical release of a surface-confined cobalt carbonyl catalyst
[AD-A102112] N81-31317
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391
CATHODE RAY TUBES
An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826
CAVITY RESONATORS
Development of X-ray laser media: Measurement of gain and development of cavity resonators for wavelengths near 130 Angstroms
[AD-A102335] N81-31539
Unstable resonators
[AD-A102071] N81-31540
Resonators with small apertures N81-31572
CELL ANODES
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables
[AD-A102083] N81-31639
CELL DIVISION
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
CELLS (BIOLOGY)
Membrane-membrane interactions in a lipid-containing bacteriophage system
[DOE/EV-03211/32] N81-31813
CELLULOSE
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
CERAMICS
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366
Operation of the Metals and Ceramics Information Center
[AD-A102212] N81-31371
High temperature mechanical properties of polyphase ceramics based on silicon nitride
[AD-A102121] N81-31372
Aging characteristics of the SA1773 ceramic capacitor
[SAND-80-1132] N81-31374
CEREBRAL CORTEX
Neuronal adaptive mechanisms underlying intelligent information processing
[AD-A101908] N81-31843
CERMETS
Thermal diffusivities of molybdenum/alumina cermets
[GEPP-TIS-472] N81-31375
CHALK
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
CHANNEL MULTIPLIERS
Infinite gamma device program
[NASA-CR-166707] N81-31476
CHANNELS (DATA TRANSMISSION)
High speed multiplex bus protocol study
[AD-A102113] N81-31191
Coexistence of one or more frequency shift keying modulation numerical channels with frequency division multiplexing-frequency modulation networks at 4, 6 and 7 GHz
[FUB-4-1981] N81-31447
Some applications of the STI-method in evaluating speech transmission channels N81-31466
CHARACTER RECOGNITION
Cursive script word recognition N81-31878
CHARACTERIZATION
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624
Characterizations and goodness of fit tests
[AD-A102167] N81-31943
CHARGE COUPLED DEVICES
Automatic test system for CCDS
[UCID-19077] N81-31489
Advanced nSb monolithic Charge Coupled Infrared Imaging Devices (CCIRID)
[NASA-CR-165766] N81-31990
Analysis of an electro-optical satellite observation
[AD-A102514] N81-32014
CHECKOUT
SNIFFER: A system that understands bugs
[AD-A102158] N81-31889
CHEMICAL ANALYSIS
Atmospheric measurements of selected hazardous organic chemicals
[PB81-200628] N81-31328
Metabolism of hydrazine
[AD-A101849] N81-31818
CHEMICAL COMPOSITION
Applications of multiproperty analysis in the prediction of complex-system thermophysical behavior N81-31301
Effect of production conditions on physical and mechanical properties of aluminum with low iron concentrates N81-31330
The origin of the Crab Nebula and the electron capture supernova in 8-10 M solar mass stars
[NASA-TM-82179] N81-32097
CHEMICAL COMPOUNDS
Design of the CSIN (Chemical Substances Information Network) User Services Office
[PB81-196362] N81-32080
CHEMICAL PROPERTIES
Characterization of the physico-chemical properties of polymeric materials for aerospace flight --- nickel cadmium batteries
[NASA-CR-160070] N81-31362
CHEMICAL REACTIONS
Computer simulation techniques for artificial modification of the ionosphere
[AD-A102302] N81-31722
CHEMICAL REACTORS
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings
[DOE/ET-10245/1-VOL-2] N81-31351
CHEMICAL TESTS
Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380
CHEMILUMINESCENCE
Requirements for improved infrared prediction capability: LWIR
[AD-A102523] N81-32013
CHEMISORPTION
Theory of phase transitions in chemisorbed two-dimensional systems N81-32046
Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058
CHLORINATION
Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698
CHLORINE
The abundance and distribution of chlorine in meteorites N81-32105
CHLOROCARBONS
Ozone depletion calculations
[UCRL-85814] N81-31730
CHLOROPHYLLS
Oceanic Lidar
[NASA-CP-2194] N81-31801
CHORDS (GEOMETRY)
Circle graphs N81-31872
CHROMIUM
Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355
Electrochromism in thin films of tungsten trioxide and neodymium-doped tungsten trioxide N81-32053
CHROMIUM ALLOYS
Method for preparing ferrochromium alloys by vacuum reduction and simple melting of reduced products
[PB81-197196] N81-31357
CHROMOSPHERE
Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108
CIRCLES (GEOMETRY)
Circle graphs N81-31872
CIRCUIT BREAKERS
Experimentally determined performance of some residential circuit breakers
[PB81-197048] N81-31498
CIRCUIT PROTECTION
Experimentally determined performance of some residential circuit breakers
[PB81-197048] N81-31498
CIRCULAR CYLINDERS
Thermal conduction in a composite circular cylinder: A new technique for thermal conductivity measurements of lunar core samples
[NASA-TM-82331] N81-31500
CITIES
Guideline for applying the the Airshed Model to urban areas
[PB81-200529] N81-31699
CIVIL AVIATION
Improved weather services for helicopter operations in the Gulf of Mexico
[AD-A102209] N81-31786
CLADDING
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530
CLASSIFICATIONS
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598
Improved version of the split routine for CLASSY
[E81-10210] N81-31600
CLASSIFYING
A parametric analysis of structured and unstructured Q-sort data
[AD-A102169] N81-31944
CLEAN ENERGY
Advanced coal combustion systems
[GPO-69-289] N81-31309
CLEARANCES
CF6 high pressure compressor and turbine clearance evaluations N81-31198
CLIMATE
Meteorological data. Volume 3, number 4: Comparative investigation between the climate prevailing during the full 24-hour day and that during the nine-hour working day (7 a.m. - 4 p.m.) in Berlin, series A monographs
[ISSN-0342-4324] N81-31742
Sun and Climate --- conferences N81-31749
Role of solar and non-solar sources in changing global climate in the past several hundred years N81-31759
CLIMATOLOGY
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
Solar cycle and solar terrestrial relationships --- to weather N81-31752
Rainfall patterns in South Africa, southeastern Australia and New Zealand N81-31754
Power spectra of the climatological variations in Mexico City --- solar terrestrial interactions N81-31755

The 200, 22 and 11 year cycles and long series of climatic data, mainly since 200 AD --- atmospheric pressure N81-31757

Role of solar and non-solar sources in changing global climate in the past several hundred years N81-31759

Quasi-biennal oscillation of solar activity and its control of the Earth's climate --- solar neutrinos N81-31761

Possible influence of solar rotation on tropospheric circulation N81-31762

The magnetosphere, interface between the Sun and the lower atmosphere N81-31763

On the possible effect of long-lasting absence of solar activity on climatic changes N81-31764

Solar activity and variations of meteorological parameters --- climate N81-31765

Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771

Beryllium-10 as a potential probe of solar variability influence on climate N81-31772

Formation of the Earth and alteration of the climate N81-31773

A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774

The changing atmosphere: Its role in climate --- biological aspects N81-31776

Fluctuations, solar periodicities, and climatic transitions --- climate modeling N81-31777

Working group 2: Physical mechanisms N81-31779

Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784

CLINICAL MEDICINE

Radiation biophysics research
[LBL-11700] N81-31811

CLOUD CHAMBERS

Construction of full size cloud simulation chamber
[AD-A101836] N81-31237

CLOUD PHYSICS

Convective cloud modification potential in Illinois compared with that for south Florida and deduced from soundings and cloud physics measurements
[PB81-198681] N81-31798

CLOUD SEEDING

Project skywater data inventory: SCPP season, Sierra Cooperative Pilot Project
[PB81-185803] N81-31794

CLUMPS

The classification and mixture maximum likelihood approaches to cluster analysis
[AD-A102084] N81-31946

CLUTTER

Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428

CMOS

Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065

COAGULATION

Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698

COAL

Effect of oscillating flow on combustion rate of coal particles N81-31300

Direct method determination of the gas content of coal: Procedures and results
[PB81-196735] N81-31401

COAL DERIVED GASES

Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases
[DOE/ET-14809/6] N81-31322

COAL GASIFICATION

Evolution of fuel nitrogen during the vacuum thermal devolatilization of coal
[DOE/ET-10744/T3] N81-31390

Alternate fuels manufactured from high temperature solar thermal systems
[DOE/ET-21067/2] N81-31397

COAL LIQUEFACTION

EDS coal liquefaction process development, phase 4. Construction of Exxon coal liquefaction pilot plant
[DOE/ET-10069/T4] N81-31389

Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391

COAL UTILIZATION

Advanced coal combustion systems
[GPO-69-289] N81-31309

Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385

Development and heat transfer analysis of direct coal fired MHD combustors
[DOE/ET-10815/T4] N81-31518

COASTAL CURRENTS

Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805

An empirical model for tidal currents in Puget Sound, Strait of Juan de Fuca, and Southern Strait of Georgia
[PB81-197345] N81-31806

COASTAL ZONE COLOR SCANNER

Oceanic Lidar
[NASA-CP-2194] N81-31801

COATINGS

Wavefront errors produced by multilayer thinfilm optical coatings N81-31983

COAXIAL CABLES

The collinear coaxial array antenna
[RSRE-MEMO-3350] N81-31444

COAXIAL PLASMA ACCELERATORS

Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036

COBALT ALLOYS

Conservation of Strategic Aerospace Materials (COSAM) N81-31208

COBALT COMPOUNDS

The 4th International Workshop on Rare-Cobalt Permanent Magnets and their Application
[PB81-196024] N81-31955

COCKPITS

Information transfer within the cockpit: Problems in intracockpit communications N81-31167

Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462

CODING

Code translation program for Hewlett-Packard computers
[SAND-81-0627] N81-31897

COGENERATION

Cogeneration
[GPO-68-746] N81-31638

COGNITION

Integrating local information to understand dialog N81-31879

COHERENT RADIATION

Achromatic coherent optical systems for information processing and holography N81-31986

COLD WORKING

Blast-resistant capacities of cold-formed steel panels
[AD-A101915] N81-31343

COLLISION AVOIDANCE

Active beacon collision avoidance logic evaluation. Volume 1: Mode C equipped (ATCRBS) threat phase
[AD-A102163] N81-31181

COLOMBIA

Highlights of NASA/DOE photovoltaics market assessment visit to Colombia
[NASA-TM-84011] N81-32081

COLOR CENTERS

Color center lasers for infrared spectroscopy N81-31536

COLOR CODING

Theory for coloring bivariate statistical maps
[DOE/EV-10428/9] N81-31610

COLORADO RIVER (NORTH AMERICA)

Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin
[PB81-197626] N81-31737

COLUMNS (SUPPORTS)

Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583

COMBAT

Human performance in continuous operations: Description of a simulation model and user's manual for evaluation of performance degradation
[AD-A101950] N81-31856

COMBINED CYCLE POWER GENERATION

Development and validation of reliability forecast techniques for selected thermomechanical components of gas-turbine combined-cycle plants: Guidelines for making reliability forecasts
[EPRI-AP-1848] N81-31664

COMBUSTION

Lignite combustion test project summary report
[DOE/FC-02030/T1] N81-31323

COMBUSTION CHAMBERS

Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204

Structure of H2-02 flames under pressure
[AD-A102108] N81-31312

Combustion in high speed air flows
[AD-A102336] N81-31320

Development and heat transfer analysis of direct coal fired MHD combustors
[DOE/ET-10815/T4] N81-31518

High temperature turbine technology program. Phase 2: Technology test and support studies
[CW-WR-76-02086] N81-31554

COMBUSTION CONTROL

Effect of oscillating flow on combustion rate of coal particles N81-31300

Exhaust sensor for heating systems --- combustion optimization and pollution control
[BMFT-FB-T-80-054] N81-31326

COMBUSTION EFFICIENCY

Exhaust sensor for heating systems --- combustion optimization and pollution control
[BMFT-FB-T-80-054] N81-31326

COMBUSTION PHYSICS

Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221

COMFORT

Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848

COMMAND AND CONTROL

Investigation of parameters affecting voice recognition systems in C3 Systems
[AD-A102371] N81-31426

Generalized monitoring facility. User's manual
[AD-A102392] N81-31887

COMMAND GUIDANCE

A small operating system for real-time runs on a Nord-10
[FOA-C-20336-E3] N81-31900

COMMERCIAL AIRCRAFT

Advanced subsonic transport propulsion
[NASA-TM-82696] N81-31195

Terminal area automatic navigation, guidance, and control 1: Automatic rollout, turnoff, and taxis
[NASA-CR-3451] N81-31224

COMMUNICATION EQUIPMENT

Electronic voice communications improvements for Army aircraft N81-31454

Voice communication capability of selected inflight headgear devices N81-31467

COMMUNICATION NETWORKS

Packet communication in delta and related networks N81-31417

Technical advisory panel on the digital data communications network
[GPO-75-433] N81-31420

NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423

Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445

Coexistence of one or more frequency shift keying modulation numerical channels with frequency division multiplexing-frequency modulation networks at 4, 6 and 7 GHz
[FUB-4-1981] N81-31447

Voice communication research and evaluation system N81-31450

Generalized monitoring facility. User's manual
[AD-A102392] N81-31887

COMMUNICATION SATELLITES
SNIAS and the world market for application satellites --- television and communication satellites
[SNIAS-802-422-106] N81-31270
Mission operation report: SBS-B/Delta launch
[NASA-TM-84014] N81-31272
The 30/20 GHz demonstration system SSUS-D/BSE
[NASA-CR-165454] N81-31419
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445

COMMUNITIES
Barrier Island development near four National seashores
[PB81-196313] N81-31804

COMMUTATORS
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487

COMPARATORS
High stability buffered phase comparator
[NASA-CASE-GSC-12645-1] N81-31482

COMPARISON
Cost/performance comparisons for programs on different machines, part 2
[AD-A102266] N81-31866
On multiple comparisons --- significance tests N81-31921

COMPILERS
JOVIAL (J73) computer validator
[AD-A102386] N81-31867
SCRIBE: A document specification language and its compiler N81-31875

COMPONENT RELIABILITY
Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653

COMPOSITE MATERIALS
Toward optimization of the woven flywheel
[UCRL-15359] N81-31294
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites
[RAE-TR-75144] N81-31297
Capillary induced microstructural instabilities in directionally solidified eutectic composites N81-31329
Resin composition, process for producing the same, product produced therefrom and process for producing said product
[NASA-CASE-ARC-11331-1] N81-31363
Operation of the Metals and Ceramics Information Center
[AD-A102212] N81-31371
Plane-strain surface waves in a laminated composite
[AD-A102087] N81-31440
Thermal conduction in a composite circular cylinder: A new technique for thermal conductivity measurements of lunar core samples
[NASA-TM-82331] N81-31500
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581
Layered superconducting composites N81-32044

COMPRESSION LOADS
Long-term creep of Hanford concrete at 250 deg F and 350 deg F
[RHO-C-50] N81-31405

COMPRESSIVE STRENGTH
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590

COMPRESSOR BLADES
Improving turbine engine compressor performance retention through airfoil coatings N81-31203
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows
[AD-A102170] N81-31219

COMPTON EFFECT
High power submillimeter and infrared radiation from intense relativistic electron beams
[AD-A102487] N81-31541

COMPUTATION
On the calculation of thrust coefficient
[PERME-MEMO-150] N81-31284

COMPUTATIONAL FLUID DYNAMICS
Report of the panel on theoretical aerodynamics N81-31152
A calculation method for the viscous flow around multi-component airfoils
[NLR-TR-79097-U] N81-31523
Computation aspects and results of low-speed viscous flow about multicomponent airfoils
[NLR-MP-80034-U] N81-31526

COMPUTER COMPATIBLE TAPES
User's guide for CCT2WA (converting CCT's to work-addressable file)
[NASA-CR-161076] N81-31882

COMPUTER DESIGN
Evolutionary structure and search N81-31860

COMPUTER GRAPHICS
Generalization within automated cartographic systems
[RS-07-UT(3)] N81-31612
Facility management of computer-aided Design, Drafting/Manufacturing systems (CADD/M)
[UCRL-84959] N81-31895
Simplified plotting package for the LSI-11 computer and Tektronix terminals
[GA-A-16148] N81-31896

COMPUTER NETWORKS
Modeling and performance optimization of large-scale data-communication networks
[AD-A102341] N81-31437
Communicating distributed processes: A programming language concept for distributed systems N81-31874

COMPUTER PROGRAM INTEGRITY
Abstration, inspection and debugging in programming
[AD-A102157] N81-31888

COMPUTER PROGRAMMING
The design of a high-level coroutine implementation for the production of quality software N81-31873
An approach to reliable integration testing
[AD-A102477] N81-31886
Abstration, inspection and debugging in programming
[AD-A102157] N81-31888
Analyzing a syntactic family of complexity metrics --- quantifying the complexity of computer programs
[AD-A101920] N81-31890
Transformational implementation: An example
[AD-A101994] N81-31891
Design specification validation
[AD-A102361] N81-31892
Event-analysis language for high-speed data acqusition
[LA-UR-81-1550] N81-31894
Issues in the design of a beginners' programming language
[MC-IW-161/81] N81-31902
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904
Construction of integer-vector library routines for the CRAY computer
[SAND-81-8214] N82-32075

COMPUTER PROGRAMS
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows
[AD-A102170] N81-31219
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
Computer program for storage and retrieval of thermal-stability data for explosives
[MHSMP-81-29] N81-31395
Interactive optimal design of dynamically loaded structures
[PB81-195679] N81-31410
Color center lasers for infrared spectroscopy N81-31536
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity
[NLR-TR-79121-U] N81-31589
Improved version of the split routine for CLASSY
[E81-10210] N81-31600
Evolutionary structure and search N81-31860
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
Cost/performance comparisons for programs on different machines, part 2
[AD-A102266] N81-31866
The design of a high-level coroutine implementation for the production of quality software N81-31873
Mail LOG: Program operating instructions
[NASA-CR-159065] N81-31881
User's guide for CCT2WA (converting CCT's to work-addressable file)
[NASA-CR-161076] N81-31882
FAVS enhancements
[AD-A102218] N81-31883
Design specification validation
[AD-A102361] N81-31892
Code translation program for Hewlett-Packard computers
[SAND-81-0627] N81-31897
Computation of the integral of the bivariate normal distribution over arbitrary polygons
[AD-A102466] N81-31928

COMPUTER STORAGE DEVICES
Bulk-memory processor for data acquisition
[LA-UR-81-1568] N81-31869
User's guide for CCT2WA (converting CCT's to work-addressable file)
[NASA-CR-161076] N81-31882

COMPUTER SYSTEMS DESIGN
An approach to the generation of software life cycle support systems N81-31877
Integrating local information to understand dialog N81-31879
Issues in the design of a beginners' programming language
[MC-IW-161/81] N81-31902

COMPUTER SYSTEMS PERFORMANCE
Evaluation of natural language processors N81-31858
Cost/performance comparisons for programs on different machines, part 2
[AD-A102266] N81-31866

COMPUTER SYSTEMS PROGRAMS
Evaluation of natural language processors N81-31858
SNIFFER: A system that understands bugs
[AD-A102158] N81-31889
Simplified plotting package for the LSI-11 computer and Tektronix terminals
[GA-A-16148] N81-31896

COMPUTER TECHNIQUES
Generalization within automated cartographic systems
[RS-07-UT(3)] N81-31612

COMPUTER VISION
Computing with connections --- computer modeling of animal brains: vision
[AD-A102221] N81-31885

COMPUTERIZED DESIGN
Interactive optimal design of dynamically loaded structures
[PB81-195679] N81-31410
A knowledge-based design environment for digital electronics N81-31880
Abstration, inspection and debugging in programming
[AD-A102157] N81-31888
Facility management of computer-aided Design, Drafting/Manufacturing systems (CADD/M)
[UCRL-84959] N81-31895
Issues in the design of a beginners' programming language
[MC-IW-161/81] N81-31902

COMPUTERIZED SIMULATION
Three-dimensional transonic flow analysis
[AD-A101944] N81-31153
Transition and conversion trim-maps for the AV-8A VTOL aircraft
[AD-A102155] N81-31188

Study of an attitude acquisition measurement technique using the ESA starmapper. Part 1: Executive summary --- computerized simulation
[NLR-TR-79116-U-PT-1] N81-31279
Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
Two-dimensional simulation of GaAs MESFETS using the finite element method N81-31479
Electromagnetic theta gun and tubular projectiles
[SAND-80-1988] N81-31490
Numerical experiments in homogeneous turbulence
[NASA-TM-81315] N81-31508
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535
Computer simulation techniques for artificial modification of the ionosphere
[AD-A102302] N81-31722
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
Computing with connections --- computer modeling of animal brains: vision
[AD-A102221] N81-31885
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems, volume 1 --- modeling geothermal drilling costs
[SAND-80-7154/1-VOL-1] N81-31898
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems. Volume 2: Subprogram description --- geothermal drilling
[SAND-80-7154/2-VOL-2] N81-31899
Analysis and computer studies for magnetostatic surface wave transducers
[AD-A102207] N81-31954

COMPUTERS

A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228

CONCAVITY

Acoustic radiation and diffraction from convex and concave domes
[AD-A102295] N81-31958

CONCENTRATION (COMPOSITION)

CF6-50 engine emissions testing with traverse probe
[AD-A102159] N81-31218
Polyacrylamide polymer viscosity as a function of brine composition
[DOE/BETC/RI-80/12] N81-31373

CONCENTRATORS

Commercialization of a photovoltaic concentrator: Acurex report
[SAND-80-7082] N81-31665

CONCRETES

Long-term creep of Hanford concrete at 250 deg F and 350 deg F
[RHO-C-50] N81-31405
Asphaltic concrete overlays of rigid and flexible pavements
[PB81-197394] N81-31407
Analysis and design of continuously reinforced concrete pavements N81-31564
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590

CONDENSATES

Onset of condensation effects in cryogenic wind tunnels N81-31139
Carbon dioxide, condensation nuclei and wind climatology of the Barrow GMCC Observatory (1973-1979)
[PB81-198715] N81-31800

CONDITIONING (LEARNING)

Neuronal adaptive mechanisms underlying intelligent information processing
[AD-A101908] N81-31843

CONDUCTIVE HEAT TRANSFER

Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Exact finite elements for conduction and convection
[NASA-CR-164723] N81-31507
Thermal shocking an elastic half-space with a laser pulse N81-31562

CONDUCTIVITY

Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer
[AD-A102290] N81-31367

CONFERENCES

Dynamic Stability Parameters --- conferences
[AGARD-LS-114] N81-31105
High Reynolds number research - 1980
[NASA-CP-2183] N81-31130
Advances in inertial navigation systems and components
[AGARD-AG-254] N81-31172
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
Spacelab utilization: Materials research and processing technology in space --- conferences
[DGLR-80-02] N81-31241
Report on the Military Microwaves' 1980 Conference
[RSRE-MEMO-3348] N81-31443
Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681
Sun and Climate --- conferences N81-31749
Oceanic Lidar
[NASA-CP-2194] N81-31801
The 4th International Workshop on Rare-Cobalt Permanent Magnets and their Application
[PB81-196024] N81-31955
Optics workshop: View of the applications of the Space Optics Laboratory, Aug. 1979 --- conferences, Aug. 1979
[BMFT-FB-W-79-44] N81-31993
Proceedings of the Symposium: Perspectives on Scientific and Technical Information
[ORNL-5749] N81-32076

CONFINEMENT

Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
Particle-confinement criteria for axisymmetric field-reversed magnetic configurations
[CONF-810450-1] N81-31977
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030

CONFORMAL MAPPING

Quantum conformal fluctuations near the classical space-time singularity
[PREPRINT-64] N81-32071

CONGRESSIONAL REPORTS

Airport and airway system development act of 1981
[GPO-75-804] N81-31231
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
Advanced coal combustion systems
[GPO-69-269] N81-31309
Methane Transportation Research, Development, and Demonstration Act of 1980
[PUBL-96-126] N81-31381
Synthetic fuel oversight hearing
[GPO-76-079] N81-31382
Energy from open ocean kelp farms
[GPO-51-285] N81-31383
Alcohol fuels
[GPO-70-454] N81-31384
Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385
Industrial innovation
[GPO-70-074] N81-31403
Technical advisory panel on the digital data communications network
[GPO-75-433] N81-31420
Communications research and development
[GPO-66-114] N81-31422
World petroleum outlook, 1981
[PUBL-97-4] N81-31608
Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636
Cogeneration
[GPO-68-746] N81-31638
A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679
NASA Authorization, 1982, volume 5
[GPO-79-550] N81-32082
Resource Conservation and Development Act
[GPO-67-017] N81-32083

CONICAL BODIES

Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582

CONJUGATES

K-line iterative methods: A conjugate-gradient approach --- two-dimensional parabolic and elliptic difference equations
[LA-UR-81-1409] N81-31916

CONSOLIDATION

Stress-assisted diffusion and consolidation with double porosity N81-31561

CONSTRUCTION

EDS coal liquefaction process development, phase 4. Construction of Exxon coal liquefaction pilot plant
[DOE/ET-10069/T4] N81-31389

CONSTRUCTION MATERIALS

Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653

CONTACT LENSES

The indications of the use of contact lenses in aeronautics N81-31851

CONTAMINANTS

Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622
Estimated contributions of Swedish and outside sources to background aerosol concentrations in Sweden
[CM-50] N81-31688

CONTENT

Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380

CONTINUUM MECHANICS

Plastic dislocation motion via nonequilibrium molecular and continuum dynamics
[UCRL-84146] N81-32068

CONTOUR SENSORS

Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603

CONTOURS

A technique for line extraction from LANDSAT multi-spectral scanner satellite data with some applications of the technique
[RAE-TR-81010] N81-31613

CONTRACTS

EDS coal liquefaction process development, phase 4. Construction of Exxon coal liquefaction pilot plant
[DOE/ET-10069/T4] N81-31389

CONTROL STABILITY

Analytical determination of dynamic stability parameters N81-31117

CONTROL SURFACES

Control derivatives N81-31119

CONTROL THEORY

Pilot interaction with automated airborne decision making systems
[NASA-CR-164729] N81-31847

CONTROLLED FUSION

Particle-confinement criteria for axisymmetric field-reversed magnetic configurations
[CONF-810450-1] N81-31977
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030
Status of the US heavy ion fusion program
[SLAC-PUB-2722] N81-32035

CONVECTION

Convection in a floating zone without rotation --- on Earth and under reduced gravity N81-31263
Marangoni convection in a rotating melting zone N81-31264
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745

CONVECTIVE FLOW

Marangoni convection in a rotating melting zone N81-31264

CONVECTIVE HEAT TRANSFER

Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Exact finite elements for conduction and convection
[NASA-CR-164723] N81-31507

The effect of body forces on the motion and heat transfer of confined fluids
[AD-A102042] N81-31512
Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 2
[NASA-CR-161841] N81-31634
Interface convection under microgravity conditions N81-31999
Flow phenomena in a floating zone and feasibility of their investigation by means of the Space optics Laboratory --- in view of low gravity manufacturing N81-32000
Special problems encountered in the optical measurement of Marangoni-convection flow fields --- crystal melts N81-32001
Orientation experiment on the convection in metal melts --- under reduced gravity N81-32002
Cell convection of reduced gravity --- in crystal melts N81-32003
Influence of transverse magnetic fields --- and rotation on Marangoni-convection in crystal melts N81-32004

CONVERSATION
Integrating local information to understand dialog N81-31879

CONVEXITY
Acoustic radiation and diffraction from convex and concave domes
[AD-A102295] N81-31958

COOLING
High temperature turbine technology program. Phase 2: Technology test and support studies
[CW-WR-76-02086] N81-31554

COOLING SYSTEMS
Construction of full size cloud simulation chamber
[AD-A101836] N81-31237
The APL satellite refrigerator program
[AD-A102377] N81-31274

COPOLYMERS
Electrical properties of pyrrole and its copolymers
[AD-A102292] N81-31368

COPPER
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052

COPYRIGHTS
How to investigate the copyright status of a work
[CIRCULAR-R22] N81-32084

CORN
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614

CORONAL HOLES
Study of geomagnetic storms, solar flares, and centers of activity in 1977
[AD-A102301] N81-32109

CORONARY ARTERY DISEASE
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
Non-invasive evaluation of the coronary circulation N81-31828
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
Epidemiological basis for the prevention of coronary heart disease N81-31835
Prevention of cardiovascular diseases N81-31836

CORONARY CIRCULATION
Non-invasive evaluation of the coronary circulation N81-31828

CORRECTION
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
Compact deferred correction formulas
[TRITA-NA-8007] N81-31918

CORRELATION
Information transfer in the surface component of the system: Coordination problems in air traffic control N81-31165

CORROSION
Prevention of corrosion and fatigue failure of helicopter gas turbine compressors
[NLR-MP-80024-U] N81-31222
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339

CORROSION PREVENTION
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings
[DOE/ET-10245/1-VOL-2] N81-31351

CORROSION TESTS
Prevention of corrosion and fatigue failure of helicopter gas turbine compressors
[NLR-MP-80024-U] N81-31222

COSMIC RAYS
Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113

COSMOLOGY
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106

COST ANALYSIS
Actual versus simulated equipment for aircraft maintenance training: Cost implications of the incremental versus the unique device
[AD-A102388] N81-31104
Vehicle concepts and technology requirements for buoyant heavy-lift systems
[NASA-TP-1921] N81-31185
Candidate R&D thrusts for the software technology initiative
[AD-A102180] N81-31884
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems, volume 1 --- modeling geothermal drilling costs
[SAND-80-7154/1-VOL-1] N81-31898

COST EFFECTIVENESS
Cost effective stream and effluent monitoring
[PB81-202210] N81-31701
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
Cost/performance comparisons for programs on different machines, part 2
[AD-A102266] N81-31866

COST ESTIMATES
NAS automation equipment operating cost estimates, FY 1978 - 1979
[AD-A102023] N81-31182

COST REDUCTION
Advances in inertial navigation systems and components
[AGARD-AG-254] N81-31172
Tuned gyro cost reduction through a novel hinge design N81-31173

COUPLING
On coupling of diffusion processes
[CTH-MATH-1981-1] N81-31950

COVARIANCE
Covariance operators and their applications in probability and information theory N81-31923

CRAB NEBULA
Spectrophotometry of galactic supernova remnants N81-32094
The origin of the Crab Nebula and the electron capture supernova in 8-10 M solar mass stars
[NASA-TM-82179] N81-32097

CRACK GEOMETRY
Stress-intensity factor equations for cracks in three-dimensional finite bodies
[NASA-TM-83200] N81-31578

CRACK PROPAGATION
Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346
Analysis and design of continuously reinforced concrete pavements N81-31564
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity
[NLR-TR-79121-U] N81-31589
A diffusive crack growth model for creep fractures
[PB81-196883] N81-31591
The application of optical fibers for monitoring devices for the detection of plastic strain and cracking
[NMI-R-72] N81-32020

CRACKING (FRACTURING)
Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346
Analysis and design of continuously reinforced concrete pavements N81-31564
The continuous damage theory of brittle materials and its applications in plane problems N81-31575
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581

CRACKS
Stress-intensity factor equations for cracks in three-dimensional finite bodies
[NASA-TM-83200] N81-31578

CREEP PROPERTIES
Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192
Long-term creep of Hanford concrete at 250 deg F and 350 deg F
[RHO-C-50] N81-31405
A diffusive crack growth model for creep fractures
[PB81-196883] N81-31591

CROP GROWTH
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599

CROP IDENTIFICATION
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598

CROP INVENTORIES
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614

CROP VIGOR
Meteorological satellite data: A tool to describe the health of the world's agriculture
[E81-10204] N81-31596
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599

CROSS COUPLING
Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120

CRUDE OIL
World petroleum outlook, 1981
[PUBL-97-4] N81-31608

CRUISE MISSILES
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine
[AD-A102257] N81-31220

CRUSHING
Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582
Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583

CRUSTAL FRACTURES
Analysis of local variations in free field seismic ground motion N81-31709

CRYOGENIC WIND TUNNELS
Preliminary results of buffet tests in a cryogenic wind tunnel --- conducted in Langley 0.3 m transonic cryogenic tunnel
[NASA-TM-81923] N81-31124
Pathfinder model program for the National Transonic Facility N81-31135
Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136
Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138

Onset of condensation effects in cryogenic wind tunnels N81-31139
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Aircraft design using the National Transonic Facility N81-31143
Proposed aeroelastic and flutter tests for the National Transonic Facility N81-31144
Preliminary user planning for the NASA National Transonic Facility N81-31145
Report of the panel on fluid dynamics N81-31146
High lift technology N81-31147
Configuration aerodynamics N81-31148
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
Report of the wind tunnel/flight correlation panel N81-31150
High Reynolds number research requirements for space vehicle design N81-31151
Report of the panel on theoretical aerodynamics N81-31152

CRYOGENICS
Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058

CRYSTAL DEFECTS
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056
Generalization of the Nernst-Einstein equation for self-diffusion in high-defect-concentration solids [CONF-810566-1] N81-32066

CRYSTAL DISLOCATIONS
Plastic dislocation motion via nonequilibrium molecular and continuum dynamics [UCRL-84146] N81-32068

CRYSTAL GROWTH
Construction and test of a mono-ellipsoid mirror heating facility --- for crystal growth experiments during space flight N81-31258
Biochemical preparatory and analytical developments and plans in connection with the Spacelab programs --- protein crystal growth N81-31261
Convection in a floating zone without rotation --- on Earth and under reduced gravity N81-31263
Low-cost epitaxial techniques for solar-cell fabrication [SERI/TR-8274-1-T1] N81-31650
Protein crystal growth under space conditions N81-32009

CRYSTAL LATTICES
Theory of phase transitions in chemisorbed two-dimensional systems N81-32046
Dynamics of a finite square bicrystal lattice with a linear interface N81-32059

CRYSTAL STRUCTURE
Results of experiments on directional solidification of the InSb-NiSb eutectic in the gradient heating facility of CNES, Toulouse. Draft of a characterizing program for eutectic probes N81-31259
Growth of beryllium monocrystals for neutron monochromators N81-31260
Reaction kinetics in molten glasses N81-31265

CUMULATIVE DAMAGE
The continuous damage theory of brittle materials and its applications in plane problems N81-31575
Demonstration of subsidence monitoring system [DOE/ET-10029/T1] N81-31731

CUMULUS CLOUDS
Convective cloud modification potential in Illinois compared with that for south Florida and deduced from soundings and cloud physics measurements [PB81-198681] N81-31798

CURING
Resin composition, process for producing the same, product produced therefrom and process for producing said product [NASA-CASE-ARC-11331-1] N81-31363

CURVE FITTING
Journal of research of the National Bureau of Standards, volume 86, number 1 [PB81-196198] N81-31327

CURVES (GEOMETRY)
Experience with generalized Hough Transform [AD-A102222] N81-31913

CYCLIC LOADS
Tension-tension fatigue behavior of the Space Shuttle strain-isolation-pad material [NASA-TM-83183] N81-31577
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity [NLR-TR-79121-U] N81-31589

CYCLONES
Further analysis of tropical cyclone characteristics from rawinsonde compositing techniques [AD-A102053] N81-31785
Tropical cyclones (1980): Central Pacific [PB81-198699] N81-31799

CYGNUS CONSTELLATION
Spectrophotometry of galactic supernova remnants N81-32094

CYLINDRICAL BODIES
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies [NMI-R-71] N81-31522
Table of the modified Bessel functions of orders zero and one together with the function phi(z)=(21sub1)(z)/(zlsub0)(z) and its reciprocal for complex argument [AD-A102444] N81-31912

CYLINDRICAL PLASMAS
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator [LA-UR-81-1442] N81-32029

CYLINDRICAL SHELLS
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
Casimir self-stress on a perfectly conducting cylindrical shell [DOE/ER-01545-308] N81-31584

CYLINDRICAL TANKS
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565

D

D REGION
Interpreting electron temperature changes in the lower ionosphere N81-31705
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments [DOE/ER-10160/4] N81-31732

DAMPING
Dynamic response of tuned secondary systems N81-31567

DATA ACQUISITION
Study of an attitude acquisition measurement technique using the ESA starmapper, part 2 [NLR-TR-79116-U-PT-2] N81-31280
Vertebrate behavior and ecology [DOE/EV-01332/T1] N81-31684
Bulk-memory processor for data acquisition [LA-UR-81-1568] N81-31869
Event-analysis language for high-speed data acqusition [LA-UR-81-1550] N81-31894

DATA BASE MANAGEMENT SYSTEMS
Candidate R&D thrusts for the software technology initiative [AD-A102180] N81-31884

DATA BASES
Mail LOG: Program operating instructions [NASA-CR-159065] N81-31881
Query processing in a distributed database N81-32072
LAMMR world data base documentation support and demonstrations [NASA-CR-166706] N81-32073

DATA CORRELATION
An instrument for determining coincidence and elapse time between independent sources of random sequential events [NASA-CASE-LAR-12531-1] N81-31529
Meteorological satellite data: A tool to describe the health of the world's agriculture [E81-10204] N81-31596
Working group 1: Statistical methods --- experimental design, data correlation N81-31778

DATA MANAGEMENT
State energy modeling. Volume 1: An analysis of state energy modeling [DOE/CS-10046/2-VOL-1] N81-31660
Mail LOG: Program operating instructions [NASA-CR-159065] N81-31881

DATA PROCESSING
SCRIBE 1 data analysis [AD-A102262] N81-31315
Generalization within automated cartographic systems [RS-07-UT(3)] N81-31612
Seismic data analysis center [AD-A102537] N81-31724
An approach to the generation of software life cycle support systems N81-31877
User's guide for CCT2WA (converting CCT's to work-addressable file) [NASA-CR-161076] N81-31882
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
Query processing in a distributed database N81-32072

DATA PROCESSING EQUIPMENT
NAS automation equipment operating cost estimates, FY 1978 - 1979 [AD-A102023] N81-31182

DATA RECORDING
Continuous recording of the ECG according to the Holter method N81-31834

DATA REDUCTION
Interpretation and normalization of experimental data for total, scattering, and reaction cross sections --- fast neutron data [CONF-800979-20] N81-31970

DATA RETRIEVAL
Mail LOG: Program operating instructions [NASA-CR-159065] N81-31881

DATA STORAGE
Electrical characterization of microprocessor memories [AD-A102305] N81-31862
High-speed GaAs MESFET memory study [AD-A102252] N81-31863
Mail LOG: Program operating instructions [NASA-CR-159065] N81-31881
Abstract storage structures --- programming languages, abstract data types [MC-IW-158/81] N81-31901

DATA TRANSMISSION
Event-analysis language for high-speed data acqusition [LA-UR-81-1550] N81-31894

DECAMETRIC WAVES
Decameter-wave radio observations of Jupiter during the 1977 apparition [NASA-TM-84012] N81-32095

DECAY RATES
Temporal decay of the optically induced properties of a small-polaronic solid [SAND-81-1268C] N81-32017

DECELERATION
The analysis and design of shock absorbers with constant deceleration for variable loading N81-31548

DECISION MAKING
Sequential decision rules for failure detection [NASA-CR-164847] N81-31559
State energy modeling. Volume 1: An analysis of state energy modeling [DOE/CS-10046/2-VOL-1] N81-31660
Pilot interaction with automated airborne decision making systems [NASA-CR-164729] N81-31847

DECLINATION
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands [PB81-199598] N81-31805

DECOMPOSITION
Optimization of accelerated stability-test techniques for diesel fuels [DOE/BC-10043/25] N81-31392

DEFECTS
Detection instrumentation for cable shield defects [PB81-194540] N81-31496

DEFLAGRATION
Shock development and transition to detonation initiated by burning in porous propellant beds [AD-A102030] N81-31386

DEFORMATION
Shape optimization of sheet metal structures against crash [AD-A102024] N81-31583

DEGREES OF FREEDOM
Dynamic response of tuned secondary systems N81-31567
DELAMINATING
Investigation of the breakdown of carbon fiber electrical resistance of the resulting small particles [FOA-C-20349-F9] N81-31291
DELAWARE
Water resources data for Maryland and Delaware, water year 1980 [PB81-195885] N81-31616
DELAY LINES
HF/UHF low-loss nanosecond variable delay lines [AD-A102271] N81-31431
DELTA LAUNCH VEHICLE
Mission operation report: SBS-B/Delta launch [NASA-TM-84014] N81-31272
DELTA MODULATION
Packet communication in delta and related networks N81-31417
DELTA WINGS
Preliminary results of buffet tests in a cryogenic wind tunnel --- conducted in Langley 0.3 m transonic cryogenic tunnel [NASA-TM-81923] N81-31124
DELTAS
Geohydrology of the Delta-Clearwater Alaska [PB81-200651] N81-31621
DEMAND (ECONOMICS)
Predicting the impacts of new technology aircraft on international air transportation demand [NASA-CR-165654] N81-31160
Energy modeling. Volume 2: Inventory and details of state energy models [DOE/CS-10046/2-VOL-2] N81-31661
District heating: Air-quality considerations and the Clean Air Act [BNL-51361] N81-31683
DENDROCHRONOLOGY
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
DENITROGENATION
Biological reduction of nitrate wastewater using fluidized-bed bioreactors [CONF-810554-2] N81-31812
DENSIFICATION
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method [SNIAS-802-422-104] N81-31296
DENSITY (MASS/VOLUME)
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713
DENSITY MEASUREMENT
Laser excited fluorescence as a plasma probe: Stochastic interpretations of preliminary experimental observations N81-31303
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear [LA-8828-MS] N81-32037
DEOXYRIBONUCLEIC ACID
Radiation biophysics research [LBL-11700] N81-31811
Repair and cell cycle response in cells exposed to environmental biohazards [DOE/EV-04568/T1] N81-31814
DEPENDENCE
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts [PB81-198293] N81-31797
Generalized Blomqvist correlation --- detecting edges in computer image processing [AD-A102058] N81-31939
DEPLETION
Ozone depletion calculations [UCRL-85814] N81-31730
DEPLOYMENT
NTF and the Department of Defense N81-31133
DEPOSITION
DC sputter gold deposition on beryllium-copper contacts [BDX-613-2629] N81-31348
Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623
Accreting white dwarf models for type 1 supernovae. 1: Presupernova evolution and triggering mechanisms [NASA-TM-83810] N81-32100
DESERTS
Terrain profiling from Seasat altimetry [NASA-CR-156878] N81-31604
DESIGN ANALYSIS
Analyzing a syntactic family of complexity metrics --- quantifying the complexity of computer programs [AD-A101920] N81-31890
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity [NASA-TM-82690] N81-31956
Thermal infrared array, phase 1. Volume 1: Technical [NASA-CR-166705] N81-31991
DESORPTION
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250
DESTRUCTION
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system [AD-A102320] N81-31268
DESTRUCTIVE TESTS
Aeroelastic instability stoppers for wind-tunnel models [NASA-CASE-LAR-12458-1] N81-31230
DETECTION
Detection of moving targets by adaptive clutter suppression [AD-A102273] N81-31428
DETONATION
Shock development and transition to detonation initiated by burning in porous propellant beds [AD-A102030] N81-31386
Detonation characteristics of dust dispersed in air [AD-A102507] N81-31387
DEVIATION
Large deviation probabilities for certain dependent processes [AD-A102166] N81-31942
Large deviations for boundary crossing probabilities [AD-A102142] N81-31947
DF LASERS
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535
DIAGNOSIS
Non-invasive evaluation of the coronary circulation N81-31828
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
Continuous recording of the ECG according to the Holter method N81-31834
Disposition of electrocardiographic abnormalities in aviation N81-31838
DIAMONDS
Ultraprecision machining of optics at Los Alamos [LA-UR-81-1962] N81-32018
DIELECTRICS
Dielectrophoresis N81-31304
Integral-operator analysis of open-boundary dielectric waveguides N81-31414
Mode theory for an equilateral triangular dielectric waveguide N81-31478
DIESEL ENGINES
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile [NASA-CR-165281] N81-32088
DIESEL FUELS
Optimization of accelerated stability-test techniques for diesel fuels [DOE/BC-10043/25] N81-31392
Filter media for collecting diesel particulate matter [PB81-197774] N81-31695
DIFFERENCE EQUATIONS
K-line iterative methods: A conjugate-gradient approach --- two-dimensional parabolic and elliptic difference equations [LA-UR-81-1409] N81-31916
DIFFERENTIAL EQUATIONS
Exact finite elements for conduction and convection [NASA-CR-164723] N81-31507
Compact deferred correction formulas [TRITA-NA-8007] N81-31918
On a generalized Falkner-Skan equation --- existence and uniquences [NLR-MP-80035-U] N81-31919
DIFFERENTIAL THERMAL ANALYSIS
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction [DOE/ET-14806/T4] N81-31391
DIFFRACTION
A hybrid UTD-eigenfunction method for scattering by a vertex [AD-A102137] N81-31429
DIFFRACTION PATTERNS
Acoustic radiation and diffraction from convex and concave domes [AD-A102295] N81-31958
DIFFUSION
Oxygen diffusion in vanadium-based alloys N81-31338
Thermodynamics and diffusion in polymer solutions containing associating species N81-31358
On coupling of diffusion processes [CTH-MATH-1981-1] N81-31950
DIFFUSION COEFFICIENT
Generalization of the Nernst-Einstein equation for self-diffusion in high-defect-concentration solids [CONF-810566-1] N81-32066
DIFFUSION THEORY
Stress-assisted diffusion and consolidation with double porosity N81-31561
DIFFUSION WELDING
Superplastic forming and diffusion bonding of CORONA 5 [AD-A102206] N81-31344
DIFFUSIVITY
Hydrogen in metals N81-31335
DIGITAL COMPUTERS
Digitally-controlled adaptive welding system [PB81-183907] N81-31556
DIGITAL DATA
Technical advisory panel on the digital data communications network [GPO-75-433] N81-31420
Meteorological satellite data: A tool to describe the health of the world's agriculture [E81-10204] N81-31596
Prototype microprocessor controller --- for STDN antennas [NASA-CR-166703] N81-31861
DIGITAL FILTERS
The utilization of microprocessors in real time numerical signal processing --- digital filters [FUB-49-1979] N81-31870
DIGITAL RADAR SYSTEMS
Development of a ground signal processor for digital synthetic array radar data [NASA-CR-161074] N81-31421
DIGITAL SIMULATION
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test [NASA-CR-3461-VOL-1] N81-31171
DIGITAL SYSTEMS
High speed multiplex bus protocol study [AD-A102113] N81-31191
Digitally-controlled adaptive welding system [PB81-183907] N81-31556
A knowledge-based design environment for digital electronics N81-31880
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems --- digital systems [FUB-3-1981] N81-31920
DIGITAL TECHNIQUES
Digital spectral analysis: A guide based on experience with aircraft vibration [RAE-TR-81014] N81-31588
Basic research in digital stochastic model algorithmic control [AD-A102145] N81-31909
DIGITAL TO VOICE TRANSLATORS
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474
DIMENSIONS
Tests for standardized generalized variances of multivariate normal populations of possibly different dimensions [AD-A102021] N81-31948

DIOPHANTINE EQUATION
Metallic hydrogen: A two-body approach to band theory and a quantum mechanical test of Diophantine methods N81-32055

DIRECT POWER GENERATORS
Small hydro plant development program
[DOE/ID-01570/T21-VOL-2-APP-A-K] N81-31652

DIRECTIONAL SOLIDIFICATION (CRYSTALS)
Results of experiments on directional solidification of the InSb-NiSb eutectic in the gradient heating facility of CNES, Toulouse. Draft of a characterizing program for eutectic probes N81-31259

DISCRETE FUNCTIONS
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems --- digital systems
[FUB-3-1981] N81-31920

DISCRIMINANT ANALYSIS (STATISTICS)
An asymptotic expansion of the distribution of the weighted-difference classification criterion for discrimination of two and three multivariate normal populations N81-31926

DISLOCATIONS (MATERIALS)
A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716

DISPERSING
Demonstration of the separation behavior of alloys using transparent model systems --- for zero gravity application N81-31253

DISPERSIONS
Dispersion of radioactive pollutant in a tornadic storm
[DP-1556] N81-31687

DISPLAY DEVICES
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test
[NASA-CR-3461-VOL-1] N81-31171

Flight simulator: Use of spacegraph display in an instructor/operator station
[AD-A101951] N81-31235

Perception of spatial features with stereoscopic displays
[AD-A102156] N81-31436

Gas-discharge matrix display --- with inherent memory
[BMFT-FB-T-80-082] N81-31492

An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826

Display panel built using optical fibers and light emitting diodes
[FOA-C-30172-E1] N81-31992

DISTORTION
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics
[FOA-C-53004-H9] N81-31845

DISTRIBUTED PARAMETER SYSTEMS
Accelerated life testing and safe dose estimation when there are competing causes of failure N81-31557

The design methodology of distributed computer systems
[AD-A102065] N81-31864

Communicating distributed processes: A programming language concept for distributed systems N81-31874

Query processing in a distributed database N81-32072

DISTRIBUTION FUNCTIONS
Finite-sum expressions for signal detection probabilities
[AD-A102143] N81-31433

Electron energy-distribution functions in gases
[CONF-810720-1] N81-31972

The ROSCOE MANUAL. Volume 27: Natural background radiation
[AD-A102524] N81-32016

DISTRIBUTION MOMENTS
The first four moments of a distribution --- properties of estimations; testing for normality
[IWIS-TNO-A-79-ST-66-36] N81-31951

DIURNAL VARIATIONS
Meteorological data. Volume 3, number 4: Comparative investigation between the climate prevailing during the full 24-hour day and that during the nine-hour working day (7 a.m. - 4 p.m.) in Berlin, series A monographs
[ISSN-0342-4324] N81-31742

Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775

DOCUMENTS
SCRIBE: A document specification language and its compiler N81-31875

How to investigate the copyright status of a work
[CIRCULAR-R22] N81-32084

DOMES (STRUCTURAL FORMS)
Acoustic radiation and diffraction from convex and concave domes
[AD-A102295] N81-31958

DOMESTIC ENERGY
Energy conservation: Emerging consensus, diverging commitment
[GPO-72-109] N81-31635

DOPES
The reaction of HF with polyacetylene
[AD-A102293] N81-31310

Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer
[AD-A102290] N81-31367

DOPPLER EFFECT
Doppler ion program description --- to measure plasma ion temperature
[GA-A-16140] N81-31973

Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations
[LA-UR-81-1247] N81-32110

DOPPLER RADAR
Satellite To Satellite Doppler Tracking (SSDT) for mapping of the Earth's gravity field
[NASA-CR-164722] N81-31601

DRIFT RATE
Banana drift transport in tokamaks with ripple
[PPPL-1784] N81-32032

DRILLING
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems, volume 1 --- modeling geothermal drilling costs
[SAND-80-7154/1-VOL-1] N81-31898

DROP TESTS
Estimation of dynamic stability parameters from drop model flight tests N81-31116

DRY HEAT
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611

DUCTS
High B-field, large area ratio MHD duct experiments
[NASA-TM-82673] N81-32026

DUST
Detonation characteristics of dust dispersed in air
[AD-A102507] N81-31387

DYE LASERS
Fluorescent probes in the solid state and their application to inorganic ion determinations N81-31305

DYNAMIC CHARACTERISTICS
Support interference N81-31113

Dynamics of a finite square bicrystal lattice with a linear interface N81-32059

DYNAMIC LOADS
Interactive optimal design of dynamically loaded structures
[PB81-195679] N81-31410

General review of the MOSTAS computer code for wind turbines
[NASA-CR-165385] N81-31628

DYNAMIC MODELS
A dynamic model of the urban process
[PB81-196990] N81-31694

DYNAMIC PROGRAMMING
Design specification validation
[AD-A102361] N81-31892

DYNAMIC RESPONSE
Aerodynamic mathematical modeling - basic concepts N81-31106

Impact of high-alpha aerodynamics on dynamic stability parameters of aircraft and missiles N81-31107

Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118

Control derivatives N81-31119

Structural response methods and evaluation results for helicopter landing decks on 210- and 270-foot USCCG cutters
[AD-A102420] N81-31233

Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565

Dynamic response of tuned secondary systems N81-31567

DYNAMIC STABILITY
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115

Estimation of dynamic stability parameters from drop model flight tests N81-31116

Analytical determination of dynamic stability parameters N81-31117

Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118

Control derivatives N81-31119

Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120

Some applications of aerodynamic formulations to problems in aircraft dynamics N81-31121

Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122

Application to missile dynamics N81-31123

Hydrodynamic stability of thin films N81-31505

DYNAMIC STRUCTURAL ANALYSIS
Structural response methods and evaluation results for helicopter landing decks on 210- and 270-foot USCCG cutters
[AD-A102420] N81-31233

DYNAMIC TESTS
Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122

DYNAMOMETERS
Dynamometer and track measurement of passenger car fuel economy
[PB81-196446] N81-32092

E

E REGION
Interpreting electron temperature changes in the lower ionosphere N81-31705

Electron transport, chemistry and optical emissions in the auroral E-layer
[AD-A102345] N81-31725

Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732

EAR PROTECTORS
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464

EARTH ATMOSPHERE
Electric fields in Earth orbital space
[AD-A102550] N81-32101

EARTH AXIS
Pole position for 1980 based on Doppler observations of the GEOS-3 Satellite
[AD-A102548] N81-31727

A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774

EARTH CRUST
Satellite To Satellite Doppler Tracking (SSDT) for mapping of the Earth's gravity field
[NASA-CR-164722] N81-31601

Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706

EARTH HYDROSPHERE
Carbon and hydrogen gases in hydrothermal systems: The search for a mantle source N81-31715

EARTH MANTLE
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706

The electrical conductivity of the Earth's upper mantle as estimated from satellite measured magnetic field variations N81-31708

Carbon and hydrogen gases in hydrothermal systems: The search for a mantle source N81-31715

A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716
EARTH MOVEMENTS
Analysis of local variations in free field seismic ground motion N81-31709
EARTH SURFACE
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
LAMMR world data base documentation support and demonstrations
[NASA-CR-166706] N81-32073
EARTH TIDES
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733
EARTHQUAKE RESISTANCE
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585
ECHOCARDIOGRAPHY
Echocardiography in aviation medicine N81-31831
ECOLOGY
A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679
Vertebrate behavior and ecology
[DOE/EV-01332/T1] N81-31684
ECONOMETRICS
Predicting the impacts of new technology aircraft on international air transportation demand
[NASA-CR-165654] N81-31160
State energy modeling. Volume 1: An analysis of state energy modeling
[DOE/CS-10046/2-VOL-1] N81-31660
Energy modeling. Volume 2: Inventory and details of state energy models
[DOE/CS-10046/2-VOL-2] N81-31661
ECONOMIC ANALYSIS
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
Solar power tower design guide: Solar thermal central receiver power systems. A source of electricity and/or process heat
[SAND-81-8005] N81-31670
ECONOMIC DEVELOPMENT
Industrial innovation
[GPO-70-074] N81-31403
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
Space Benefits: The secondary application of aerospace technology in other sectors of the economy
[NASA-CR-164733] N81-32086
ECONOMIC FACTORS
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
EDGES
Generalized Blomqvist correlation --- detecting edges in computer image processing
[AD-A102058] N81-31939
EDITING
SCRIBE: A document specification language and its compiler N81-31875
EDITING ROUTINES (COMPUTERS)
SCRIBE: A document specification language and its compiler N81-31875
EFFLUENTS
Cost effective stream and effluent monitoring
[PB81-202210] N81-31701
EIGENVALUES
On solving the large sparse generalized eigenvalue problem N81-31859
EIGENVECTORS
A hybrid UTD-eigenfunction method for scattering by a vertex
[AD-A102137] N81-31429
ELASTIC DEFORMATION
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
Acoustoelastic measurement of residual stresses N81-31571
ELASTIC PROPERTIES
Certain physical properties of transition metal alloys N81-31333
ELASTIC SCATTERING
Observation of new resonance structure in the natural spin parity strange meson system
[SLAC-PUB-2729] N81-31967
ELASTOMERS
The effect of elastomer chain length on properties of silicone-modified polyimide adhesives
[NASA-TM-83172] N81-31360
ELASTOPLASTICITY
An algorithm for evaluating the boundary integral equations in planar elasto-plastic bodies N81-31574
ELECTRIC ARCS
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354
ELECTRIC BATTERIES
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641
Storage in residential solar total-energy systems
[BNL-51230] N81-31658
Self discharge of cells with negative electrodes in lithium or lithium alloys
[BMFT-FB-T-80-031] N81-31671
ELECTRIC CONNECTORS
Optical fiber communications cable connector
[AD-A102508] N81-32015
ELECTRIC CONTACTS
DC sputter gold deposition on beryllium-copper contacts
[BDX-613-2629] N81-31348
Electron device contact studies --- contacts to gallium arsenides
[AD-A102088] N81-32061
ELECTRIC CORONA
Negative ion/molecule reactions in a negative corona discharge
[UTIAS-TN-230] N81-32027
ELECTRIC CURRENT
Analysis and test of line-commutated inverters for use in photovoltaic power systems
[DOE/ET-20279/115] N81-31491
ELECTRIC DISCHARGES
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641
Self discharge of cells with negative electrodes in lithium or lithium alloys
[BMFT-FB-T-80-031] N81-31671
ELECTRIC ENERGY STORAGE
Development of a 600 kV Marx module for a high-density z-pinch experiment
[LA-UR-81-1584] N81-32033
ELECTRIC EQUIPMENT TESTS
Effects of thermal insulation on electrical connections and outlet boxes
[PB81-197006] N81-31495
ELECTRIC FIELDS
Electric and magnetic field measurements
[PB81-218182] N81-31499
Field reversal by rotating waves
[IPPJ-526] N81-32028
Electric fields in Earth orbital space
[AD-A102550] N81-32101
ELECTRIC FUSES
Experimentally determined performance of some residential circuit breakers
[PB81-197048] N81-31498
ELECTRIC GENERATORS
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
Development of a 600 kV Marx module for a high-density z-pinch experiment
[LA-UR-81-1584] N81-32033
ELECTRIC HYBRID VEHICLES
Results of the ETV-1 breadboard tests under steady-state and transient conditions --- conducted in the NASA-LeRC Road Load Simulator
[NASA-TM-82667] N81-31627
ELECTRIC OUTLETS
Effects of thermal insulation on electrical connections and outlet boxes
[PB81-197006] N81-31495
ELECTRIC POTENTIAL
Electric and magnetic field measurements
[PB81-218182] N81-31499
ELECTRIC POWER PLANTS
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results
[NASA-CR-165235] N81-31632
Ocean thermal energy conversion power system development-2, phase 2
[DOE/ET-21056/T3] N81-31651
Solar power tower design guide: Solar thermal central receiver power systems. A source of electricity and/or process heat
[SAND-81-8005] N81-31670
District heating: Air-quality considerations and the Clean Air Act
[BNL-51361] N81-31683
ELECTRIC POWER TRANSMISSION
Net energy of seven small-scale hydroelectric power plants
[ORNL/TM-7694] N81-31649
ELECTRIC PROPULSION
Results of the ETV-1 breadboard tests under steady-state and transient conditions --- conducted in the NASA-LeRC Road Load Simulator
[NASA-TM-82667] N81-31627
ELECTRIC SWITCHES
Effects of thermal insulation on electrical connections and outlet boxes
[PB81-197006] N81-31495
ELECTRIC WELDING
Porosity of welds --- under reduced gravity N81-31255
Digitally-controlled adaptive welding system
[PB81-183907] N81-31556
ELECTRICAL ENGINEERING
A knowledge-based design environment for digital electronics N81-31880
ELECTRICAL MEASUREMENT
Tester line voltage monitor
[BDX-613-2449] N81-31531
ELECTRICAL PROPERTIES
Electrical properties of pyrrole and its copolymers
[AD-A102292] N81-31368
Analysis and test of line-commutated inverters for use in photovoltaic power systems
[DOE/ET-20279/115] N81-31491
ELECTRICAL RESISTIVITY
Nonlinear equatorial spread F: The effect of neutral winds and background Pedersen conductivity
[AD-A102555] N81-31278
The reaction of HF with polyacetylene
[AD-A102293] N81-31310
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624
The electrical conductivity of the Earth's upper mantle as estimated from satellite measured magnetic field variations N81-31708
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056
ELECTRO-OPTICS
Analysis of an electro-optical satellite observation
[AD-A102514] N81-32014
ELECTROCARDIOGRAPHY
In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819
The application of cardiograms in the valuation of navigation personnel N81-31830
Principal electrocardiographic anomalies in the valuation of navigation personnel N81-31832
Continuous recording of the ECG according to the Holter method N81-31834
Disposition of electrocardiographic abnormalities in aviation N81-31838
ELECTROCHEMICAL CELLS
Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630
Electrochemical energy storage subsystems study, volume 2
[NASA-CR-165420-VOL-2] N81-31631

ELECTROCHEMICAL MACHINING
Electrochemical deburring
[BDX-613-2594] N81-31553
ELECTROCHEMISTRY
Electrical properties of pyrrole and its copolymers
[AD-A102292] N81-31368
ELECTROCONDUCTIVITY
Self discharge of cells with negative electrodes in lithium or lithium alloys
[BMFT-FB-T-80-031] N81-31671
ELECTRODEPOSITION
Electrochromism in thin films of tungsten trioxide and neodymium-doped tungsten trioxide N81-32053
ELECTRODES
Design and assembly considerations for Redox cells and stacks
[NASA-TM-82672] N81-31308
Electrode polarization studies in hot corrosion systems --- molten salt electrolytes N81-31337
Measurement of the boundary layer adherent to the electrodes of an electrolytic cell --- under reduced gravity N81-32006
ELECTROLYSIS
Gas bubble formation in electrolytes under reduced gravity N81-31249
ELECTROLYTES
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070
ELECTROLYTIC CELLS
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables
[AD-A102083] N81-31639
Measurement of the boundary layer adherent to the electrodes of an electrolytic cell --- under reduced gravity N81-32006
ELECTROMAGNETIC ABSORPTION
Scattering and absorption of electromagnetic waves by spheroidal raindrops
[REPT-455-TBR-67] N81-31441
ELECTROMAGNETIC ACCELERATION
Electromagnetic theta gun and tubular projectiles
[SAND-80-1988] N81-31490
ELECTROMAGNETIC COMPATIBILITY
Time-domain in analysis of lumped/distributed networks for Electromagnetic Compatibility (EMC) applications --- transmission lines
[AD-A102268] N81-31439
ELECTROMAGNETIC FIELDS
Electromagnetic fields resulting from simple acceleration N81-31413
Casimir self-stress on a perfectly conducting cylindrical shell
[DOE/ER-01545-308] N81-31584
ELECTROMAGNETIC MEASUREMENT
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796
ELECTROMAGNETIC NOISE
The role of an electromagnetic environment model in spectrum management
[PB81-194672] N81-31448
ELECTROMAGNETIC RADIATION
Integral-operator analysis of open-boundary dielectric waveguides N81-31414
Variable corpuscular and electromagnetic emissions from the Sun N81-31751
ELECTROMAGNETIC SCATTERING
An investigation of a differential-integral method for calculating electromagnetic scattering by inhomogeneous objects N81-31412
Moment method solutions for radiation and scattering from arbitrarily shaped surfaces N81-31416
A hybrid UTD-eigenfunction method for scattering by a vertex
[AD-A102137] N81-31429
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting
[AD-A102309] N81-31802
ELECTROMAGNETIC SURFACE WAVES
Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415
ELECTROMYOGRAPHY
BIOCONAID system (bionic control of acceleration induced dimming)
[AD-A102510] N81-31234
ELECTRON ACCELERATION
Experimental studies of autoacceleration concepts
[AD-A101913] N81-31976
ELECTRON BEAMS
Particle beam fusion
[SAND-80-2500] N81-32038
ELECTRON EMISSION
Electronic phenomena at high pressure
[DOE/ER-01198/1350] N81-31488
ELECTRON ENERGY
Interpreting electron temperature changes in the lower ionosphere N81-31705
Electron energy-distribution functions in gases
[CONF-810720-1] N81-31972
ELECTRON GUNS
High-current, short-pulse, RF-synchronized electron gun for the Stanford Linear Accelerator
[SLAC-PUB-2705] N81-31980
ELECTRON IRRADIATION
A universal solid ion source
[AD-A102321] N81-32063
ELECTRON MOBILITY
Electron transport, chemistry and optical emissions in the auroral E-layer
[AD-A102345] N81-31725
Electronic structure of solids and their surfaces and interfaces
[AD-A101945] N81-32062
ELECTRON ORBITALS
An LCAO local density functional approach to surface electronic structure calculations --- thin films N81-32048
ELECTRON PRECIPITATION
Statistical study of precipitating electrons
[NASA-TM-80458] N81-31718
Evaluation of some geophysical events on 22 September 1979
[LA-8672] N81-31728
ELECTRON SPIN
Electron spin resonance in amorphous alloys N81-32057
ELECTRON TRANSFER
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285
Electronic phenomena at high pressure
[DOE/ER-01198/1350] N81-31488
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
ELECTRON TUNNELING
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047
Theory of quasiparticle tunneling between dissimilar superconductors N81-32050
ELECTRONIC MODULES
Prototype microprocessor controller --- for STDN antennas
[NASA-CR-166703] N81-31861
Thermal infrared array, phase 1. Volume 1: Technical
[NASA-CR-166705] N81-31991
ELECTRONS
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
ELECTROPHORESIS
Dielectrophoresis N81-31304
ELECTROSTATIC CHARGE
The Cactus accelerometer N81-31177
Development of an electrostatic printing process with gas discharge recording writing head
[BMFT-FB-T-80-084] N81-31494
ELECTROSTATIC PROBES
Development and design of three monitoring instruments for spacecraft charging
[NASA-TP-1800] N81-31282
ELEMENTARY EXCITATIONS
Theory of quasiparticle tunneling between dissimilar superconductors N81-32050
ELLIPTIC DIFFERENTIAL EQUATIONS
K-line iterative methods: A conjugate-gradient approach --- two-dimensional parabolic and elliptic difference equations
[LA-UR-81-1409] N81-31916
EMERGENCIES
Information transfer during contingency operations: Emergency air-ground communications N81-31168
EMISSION SPECTRA
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285
Photoelectron emission spectroscopy of aqueous solutions
[AD-A102426] N81-31313
SCRIBE 1 data analysis
[AD-A102262] N81-31315
Variable corpuscular and electromagnetic emissions from the Sun N81-31751
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099
EMITTANCE
Spectral emissivity at high temperatures
[AD-A101949] N81-31311
EMPHYSEMA
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681
ENCAPSULATING
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
ENCLOSURES
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142
ENDOCRINE SYSTEMS
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
ENERGY ABSORPTION
Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583
ENERGY CONSERVATION
Review of alternate automotive engine fuel economy
[PB81-186652] N81-31555
Energy conservation: Emerging consensus, diverging commitment
[GPO-72-109] N81-31635
Overview of energy-conserving development planning and design techniques based on five case studies
[ANL/CNSV-TM-59] N81-31644
ENERGY CONSUMPTION
Nonresidential building energy consumption survey
[DOE/EIA-0288] N81-31642
Overview of energy-conserving development planning and design techniques based on five case studies
[ANL/CNSV-TM-59] N81-31644
Modeling energy and society: Theory and method in assessing the social effects of energy policies. Volume 1: Executive summary
[DOE/TIC-1022359] N81-31646
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 2: Social meanings of energy
[DOE/TIC-1022360] N81-31647
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 3: The measurement model
[DOE/TIC-1022361] N81-31648
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659
State energy modeling. Volume 1: An analysis of state energy modeling
[DOE/CS-10046/2-VOL-1] N81-31660
Energy modeling. Volume 2: Inventory and details of state energy models
[DOE/CS-10046/2-VOL-2] N81-31661
ENERGY CONVERSION
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
ENERGY CONVERSION EFFICIENCY
Net energy of seven small-scale hydroelectric power plants
[ORNL/TM-7694] N81-31649
ENERGY DISSIPATION
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031

ENERGY DISTRIBUTION
Electron energy-distribution functions in gases
[CONF-810720-1] N81-31972
ENERGY METHODS
Ductile fracture toughness determined on an energy basis using polycarbonate N81-31563
ENERGY POLICY
Advanced coal combustion systems
[GPO-69-289] N81-31309
Synthetic fuel oversight hearing
[GPO-76-079] N81-31382
Energy from: open ocean kelp farms
[GPO-51-285] N81-31383
Alcohol fuels
[GPO-70-454] N81-31384
Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391
World petroleum outlook, 1981
[PUBL-97-4] N81-31608
Energy conservation: Emerging consensus, diverging commitment
[GPO-72-109] N81-31635
Cogeneration
[GPO-68-746] N81-31638
Activities report on aerospace and energy research N81-31672
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
ENERGY REQUIREMENTS
Nonresidential building energy consumption survey
[DOE/EIA-0288] N81-31642
Modeling energy and society: Theory and method in assessing the social effects of energy policies. Volume 1: Executive summary
[DOE/TIC-1022359] N81-31646
ENERGY SOURCES
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791
ENERGY SPECTRA
Statistical study of precipitating electrons
[NASA-TM-80458] N81-31718
ENERGY STORAGE
Design and assembly considerations for Redox cells and stacks
[NASA-TM-82672] N81-31308
Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630
Electrochemical energy storage subsystems study, volume 2
[NASA-CR-165420-VOL-2] N81-31631
Storage in residential solar total-energy systems
[BNL-51230] N81-31658
Salt-hydrate thermal-energy-storage system for space heating and air conditioning
[DOE/CS-34698/T1] N81-31669
Solar energy model Goennebek. Development and planning of a self-supporting heating plant for greenhouses
[BMFT-FB-T-80-119] N81-31673
Experimental studies of autoacceleration concepts
[AD-A101913] N81-31976
ENERGY TECHNOLOGY
Performance analysis of dedicated heat-pump water heaters in an office building
[SERI/TP-721-1198] N81-31404
Review of alternate automotive engine fuel economy
[PB81-186652] N81-31555
Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630
Florida's renewable energy potential
[GPO-68-757] N81-31637
District heating: Air-quality considerations and the Clean Air Act
[BNL-51361] N81-31683
Doing a risk analysis
[CONF-810480-1] N81-31822
ENERGY TRANSFER
Measurements of the CO laser characteristics by medium modulation N81-31534
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745
Experimental studies of autoacceleration concepts
[AD-A101913] N81-31976
Simple fast routine for computation of energy transport by synchroton radiation in Tokamaks and similar geometries
[SAI-023-81-189-LJ] N81-32040
ENGINE ANALYZERS
Who needs engine monitoring? N81-31209
ENGINE DESIGN
Structures performance, benefit, cost-study
[NASA-CR-165456] N81-31194
Advanced subsonic transport propulsion
[NASA-TM-82696] N81-31195
CF 6 engine diagnostics N81-31197
Performance retention of the RB211 powerplant in service N81-31201
Performance deterioration: An airline perspective N81-31202
Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204
Advanced turbine blade tip seal system N81-31205
An introduction to NASA's turbine engine hot section technology (HOST) project N81-31206
The nature of operating flight loads and their effect on propulsion system structures N81-31207
ENGINE INLETS
Fiber optics for aircraft engine/inlet control
[NASA-TM-82654] N81-31190
ENGINE MONITORING INSTRUMENTS
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
Who needs engine monitoring? N81-31209
F100 engine diagnostic system status to date N81-31210
A-10/TF34 Turbine Engine Monitoring System (TEMS) N81-31211
Helicopter propulsion system reliability and engine monitoring assessments N81-31213
Engine health monitoring systems: Tools for improved maintenance management in the 1980's N81-31214
Engine condition monitoring: CF6 family 60's through the 80's N81-31215
Engine health monitoring: An advanced system N81-31216
An overview of SAE ARP 1587: Aircraft gas turbine engine monitoring system guide N81-31217
ENGINE NOISE
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity
[NASA-TM-82690] N81-31956
ENGINE PARTS
Performance retention of the RB211 powerplant in service N81-31201
Performance deterioration: An airline perspective N81-31202
ENGINE TESTS
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
CF6 high pressure compressor and turbine clearance evaluations N81-31198
JT8D engine performance retention N81-31200
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine
[AD-A102257] N81-31220
The data processing system at FOA Institution 27. Software organization principles
[FOA-C-20361-D3] N81-32074
High-power baseline and motoring test results for the GPU-3 Stirling engine
[NASA-TM-82646] N81-32087
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile
[NASA-CR-165281] N81-32088
ENVIRONMENT EFFECTS
Solar power tower design guide: Solar thermal central receiver power systems. A source of electricity and/or process heat
[SAND-81-8005] N81-31670
District heating: Air-quality considerations and the Clean Air Act
[BNL-51361] N81-31683
Oil shale surface retorting: Environmental Characterization Information Report
[DOE/EP-0015] N81-31685
Environmental perspective on the emerging oil shale industry. Volume 2: Appendices
[PB81-196602] N81-31691
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732
Development and present state of German periglacial research in the polar, subpolar and alpine environment
[NRC/CNR-TT-1983] N81-31747
Environmental analysis burial of offsite low-level waste at SRP
[DPST-80-466] N81-31982
ENVIRONMENT MANAGEMENT
Resource Conservation and Development Act
[GPO-67-017] N81-32083
ENVIRONMENT MODELS
The role of an electromagnetic environment model in spectrum management
[PB81-194672] N81-31448
Hierarchical set of models for estimating the effects of air pollution on vegetation
[UCRL-85367] N81-31682
ENVIRONMENT PROTECTION
Advanced coal combustion systems
[GPO-69-289] N81-31309
ENVIRONMENT SIMULATION
Electric and magnetic field measurements
[PB81-218182] N81-31499
ENVIRONMENTAL CONTROL
Project skywater data inventory: SCPP season, Sierra Cooperative Pilot Project
[PB81-185803] N81-31794
ENVIRONMENTAL LABORATORIES
Voice communication research and evaluation system N81-31450
ENVIRONMENTAL MONITORING
Oil shale surface retorting: Environmental Characterization Information Report
[DOE/EP-0015] N81-31685
Environmental perspective on the emerging oil shale industry. Volume 2: Appendices
[PB81-196602] N81-31691
ENVIRONMENTAL QUALITY
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809
ENVIRONMENTAL TESTS
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine
[AD-A102257] N81-31220
ENVIRONMENTS
Failure of morphology of (0 deg)8 graphite/epoxy as influenced by environments and processing
[NASA-TM-81318] N81-31289
EPIDEMIOLOGY
Epidemiological basis for the prevention of coronary heart disease N81-31835
Prevention of cardiovascular diseases N81-31836
EPITAXY
Low-cost epitaxial techniques for solar-cell fabrication
[SERI/TR-8274-1-T1] N81-31650
EPOXY COMPOUNDS
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
EPOXY RESINS
Universal connectors for joining stringers
[NASA-CASE-LAR-12744-1] N81-31551
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
Stability characteristics of epoxy-impregnated superconducting magnets
[AD-A102419] N81-31953
EQUATIONS OF MOTION
Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138
The effect of body forces on the motion and heat transfer of confined fluids
[AD-A102042] N81-31512

EQUATIONS OF STATE
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662
EQUATORIAL REGIONS
Hydro-climatic variability in the equatorial Atlantic Correlation with solar activity N81-31756
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment
[PB81-198939] N81-31807
EQUINOXES
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805
EQUIPMENT SPECIFICATIONS
Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180
Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640
ERROR ANALYSIS
Sequential decision rules for failure detection
[NASA-CR-164847] N81-31559
Satellite measurements of tropospheric aerosols
[NASA-CR-3459] N81-31680
Second-order Particle-In-Cell (PIC) computational method in the one-dimensional variable Eulerian mesh system
[LA-UR-81-318] N81-31915
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
Wavefront errors produced by multilayer thinfilm optical coatings N81-31983
ESTIMATING
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
Estimation in latent trait models
[AD-A102216] N81-31937
On an estimation scheme for Gauss Markov random field models --- image processing
[AD-A102057] N81-31938
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates
[AD-A102413] N81-31940
ESTIMATORS
The first four moments of a distribution --- properties of estimations; testing for normality
[IWIS-TNO-A-79-ST-66-36] N81-31951
ETHYL ALCOHOL
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
Impact of gasohol on automobile evaporative and tailpipe emissions
[PB81-199952] N81-31400
EULER EQUATIONS OF MOTION
Surrogate-equation technique for simulation of steady inviscid flow
[NASA-TP-1866] N81-31129
EUTECTIC ALLOYS
Capillary induced microstructural instabilities in directionally solidified eutectic composites N81-31329
EUTECTICS
Results of experiments on directional solidification of the InSb-NiSb eutectic in the gradient heating facility of CNES, Toulouse. Draft of a characterizing program for eutectic probes N81-31259
EUTROPHICATION
Precipitation and inactivation of phosphorus as a lake restoration technique
[PB81-196511] N81-31617
Covering bottom sediments as a lake restoration technique
[PB81-200453] N81-31620
EVALUATION
Some applications of the STI-method in evaluating speech transmission channels N81-31466
EVOLUTION (DEVELOPMENT)
Evolutionary structure and search N81-31860
Accreting white dwarf models for type 1 supernovae. 1: Presupernova evolution and triggering mechanisms
[NASA-TM-83810] N81-32100
EXCIMER LASERS
Electron beam pumped tunable excimer lasers N81-31533
EXCITATION
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565
EXHAUST EMISSION
CF6-50 engine emissions testing with traverse probe
[AD-A102159] N81-31218
Impact of gasohol on automobile evaporative and tailpipe emissions
[PB81-199952] N81-31400
Development of measurement methodology for, evaluating fugitive particulate emissions
[PB81-196594] N81-31690
Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7
[PB81-196628] N81-31692
Filter media for collecting diesel particulate matter
[PB81-197774] N81-31695
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile
[NASA-CR-165281] N81-32088
EXHAUST FLOW SIMULATION
Comparison of hot and cold subsonic jets in external flow with reference to jet engine simulation
[NLR-TR-80042-U] N81-31156
EXHAUST GASES
Absorption spectroscopy of combustion gases using a tunable diode laser N81-31302
EXISTENCE THEOREMS
On a generalized Falkner-Skan equation --- existence and uniquences
[NLR-MP-80035-U] N81-31919
EXOBIOLOGY
Space life sciences --- definition - experiment proposals N81-31244
Aerospace Medicine and Biology: A continuing bibliography with indexes
[NASA-SP-7011(222)] N81-31816
EXOTHERMIC REACTIONS
Reactions of free radicals with nitro-compounds and nitrates
[AD-A102286] N81-31314
EXPERIMENTAL DESIGN
Multiple purpose facilities for materials science experiments in space N81-31251
Working group 1: Statistical methods --- experimental design, data correlation N81-31778
EXPLOSIVES
Computer program for storage and retrieval of thermal-stability data for explosives
[MHSMP-81-29] N81-31395
EXPOSURE
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817
EXTRACTION
Selective extraction of metals from Pacific Sea nodules with dissolved sulfur dioxide
[PB81-197139] N81-31356
EXTRATERRESTRIAL RADIATION
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
[NASA-CR-164724] N81-31719
EXTREMELY HIGH FREQUENCIES
The 30/20 GHz demonstration system SSUS-D/BSE
[NASA-CR-165454] N81-31419
EXTRUDING
Strain-hardening and rate effects in plasticity N81-31569
EYE (ANATOMY)
Problems in aeronautics posed by visual deficiencies N81-31855
EYE EXAMINATIONS
Problems in aeronautics posed by visual deficiencies N81-31855
EYE MOVEMENTS
Dynamics of two-dimensional eye-head tracking
[AD-A102369] N81-31842
EYE PROTECTION
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849
Eye protection and tinted lenses N81-31852
Lasers and protection of the eyes N81-31854
EYEPIECES
Conventional optical correction of ametropias in aeronautics N81-31850
The indications of the use of contact lenses in aeronautics N81-31851

F

F REGION
Nonlinear equatorial spread F: The effect of neutral winds and background Pedersen conductivity
[AD-A102555] N81-31278
F-15 AIRCRAFT
F100 engine diagnostic system status to date N81-31210
FABRICATION
Toward optimization of the woven flywheel
[UCRL-15359] N81-31294
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
Low-cost epitaxial techniques for solar-cell fabrication
[SERI/TR-8274-1-T1] N81-31650
Solar central receiver heliostat mirror module development
[SAND-79-8189] N81-31656
FACSIMILE COMMUNICATION
NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423
FACTOR ANALYSIS
The effects of gender and instructions on calibration
[AD-A102255] N81-31844
Shrinkage in principal components with applications to factor analysis N81-31922
FAILURE ANALYSIS
Failure of morphology of (0 deg)8 graphite/epoxy as influenced by environments and processing
[NASA-TM-81318] N81-31289
FAILURE MODES
Information transfer in the surface component of the system: Problems associated with briefing of relief controllers N81-31164
Delayed failure characteristics of plasma-sprayed aluminum oxide applied to stainless steel and titanium alloy substrates in various physiological media N81-31332
Power transistor switching characterization
[NASA-CR-164607] N81-31497
Accelerated life testing and safe dose estimation when there are competing causes of failure N81-31557
FAN BLADES
National Transonic Facility Fan Blade prepreg material characterization tests
[NASA-TM-81800] N81-31227
FAR FIELDS
Far field conditions in steady flows with a free stream Mach number one
[AD-A102174] N81-31155
FAR INFRARED RADIATION
Requirements for improved infrared prediction capability: LWIR
[AD-A102523] N81-32013
FARADAY EFFECT
Color center lasers for infrared spectroscopy N81-31536
FAST NEUTRONS
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820
Interpretation and normalization of experimental data for total, scattering, and reaction cross sections --- fast neutron data
[CONF-800979-20] N81-31970
FATIGUE (MATERIALS)
Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192
Failure of morphology of (0 deg)8 graphite/epoxy as influenced by environments and processing
[NASA-TM-81318] N81-31289

FATIGUE LIFE
Damage tolerance of a landing gear component after many takeoffs and landings --- nondestructive tests [NLR-MP-79039-U] N81-31189
Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204
Fracture and fatigue of bi-materials [AD-A102344] N81-31293
Ball bearing mechanics [NASA-TM-81691] N81-31550
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
FATIGUE TESTS
Tension-tension fatigue behavior of the Space Shuttle strain-isolation-pad material [NASA-TM-83183] N81-31577
FEASIBILITY ANALYSIS
Second-generation heliostat detail design report [SAND-78-8192] N81-31663
FEDERAL BUDGETS
Synthetic fuel oversight hearing [GPO-76-079] N81-31382
NASA Authorization, 1982, volume 5 [GPO-79-550] N81-32082
FEEDBACK CONTROL
A model-following technique for insensitive aircraft control systems N81-31223
A small operating system for real-time runs on a Nord-10 [FOA-C-20336-E3] N81-31900
FEMALES
The effects of gender and instructions on calibration [AD-A102255] N81-31844
FERMENTATION
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw [DOE/ID-12051/T1] N81-31393
FERMIONS
Fixed points: Fermion mass predictions [FERMILAB-CONF-81/44-THY] N81-31962
FERROELECTRICITY
Recoilless Rayleigh scattering from pure single crystals of Barium titanate near the 130 deg C ferroelectric Curie point N81-32051
FERROMAGNETIC MATERIALS
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
FIBER COMPOSITES
Silicone modified resins for graphite fiber laminates [NASA-CR-165451] N81-31290
Universal connectors for joining stringers [NASA-CASE-LAR-12744-1] N81-31551
FIBER OPTICS
Fiber optics for aircraft engine/inlet control [NASA-TM-82654] N81-31190
Fiber optic transceiver design [AD-A102362] N81-31425
Joint European Torus (JET) design study 8.3: Quasi-continuous laser scattering. Part 2: Extension to spatial scan [IPF-81-3-PT-2] N81-31544
Display panel built using optical fibers and light emitting diodes [FOA-C-30172-E1] N81-31992
Modal noise in optical fibers and signal fluctuations in an underground laid optical cable [FUB-44-1980] N81-32010
Modal noise in optical fibers --- statistical analysis, propagation modes N81-32011
Signal fluctuations in an underground laid optical cable --- optical measurement N81-32012
Optical fiber communications cable connector [AD-A102508] N81-32015
The application of optical fibers for monitoring devices for the detection of plastic strain and cracking [NMI-R-72] N81-32020
FIBER ORIENTATION
Toward optimization of the woven flywheel [UCRL-15359] N81-31294
FIBER REINFORCED COMPOSITES
Dimensional instabilities in min-K 1400 above its expected service temperature [SAND-81-8211] N81-31295
Theoretical and experimental study of the behavior of reinforced plastic plates. Part 1: General theory [CRIF-PL-14-PT-1] N81-31587
FIBER RELEASE
Investigation of the breakdown of carbon fiber electrical resistance of the resulting small particles [FOA-C-20349-F9] N81-31291
FIBRILLATION
Principal electrocardiographic anomalies in the valuation of navigation personnel N81-31832
Continuous recording of the ECG according to the Holter method N81-31834
FIELD EFFECT TRANSISTORS
Two-dimensional simulation of GaAs MESFETS using the finite element method N81-31479
High-speed GaAs MESFET memory study [AD-A102252] N81-31863
FIELD THEORY (PHYSICS)
Casimir self-stress on a perfectly conducting cylindrical shell [DOE/ER-01545-308] N81-31584
Long-range interactions in lattice field theory [SLAC-240] N81-32069
FILLERS
Fillers for improved graphite fiber retention by polymer matrix composites [NASA-CR-165437] N81-31288
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites [RAE-TR-75144] N81-31297
FILLETS
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows [AD-A102170] N81-31219
FINITE DIFFERENCE THEORY
Surrogate-equation technique for simulation of steady inviscid flow [NASA-TP-1866] N81-31129
FINITE ELEMENT METHOD
Journal of research of the National Bureau of Standards, volume 86, number 1 [PB81-196198] N81-31327
Two-dimensional simulation of GaAs MESFETS using the finite element method N81-31479
Exact finite elements for conduction and convection [NASA-CR-164723] N81-31507
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method [UCRL-85226] N81-31517
Plate bending finite element based on the extended field method N81-31573
Stress-intensity factor equations for cracks in three-dimensional finite bodies [NASA-TM-83200] N81-31578
Global function approach in structural analysis: Basic approach, numerical results [NASA-CR-165669] N81-31579
Development of an orthotropic hole element [NASA-CR-165759] N81-31580
Research on numerical algorithms for large space structures [NASA-CR-164721] N81-31911
FISSION PRODUCTS
Requirements for improved infrared prediction capability: LWIR [AD-A102523] N81-32013
FITTINGS
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting [NASA-TM-82429] N81-31402
FIXED WINGS
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
National icing facilities requirements investigation [AD-A102520] N81-31238
FLAME PROPAGATION
Flame propagation in gaseous fuel mixtures in semiconfined geometries [UCID-19000] N81-31324
Applications of Rayleigh scattering to turbulent flows with heat transfer and combustion [AD-A102176] N81-31510
FLAME RETARDANTS
Resin composition, process for producing the same, product produced therefrom and process for producing said product [NASA-CASE-ARC-11331-1] N81-31363
Phosphorus-containing imide resins [NASA-CASE-ARC-11368-1] N81-31364
FLAME STABILITY
Structure of H2-02 flames under pressure [AD-A102108] N81-31312
FLAMMABLE GASES
Flame propagation in gaseous fuel mixtures in semiconfined geometries [UCID-19000] N81-31324
FLANGES
Safety locking device between sealed vessels --- for handling radioactive materials [BLL-RISLEY-4270-(9091.9F)] N81-31545
FLIGHT CHARACTERISTICS
Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122
FLIGHT CONTROL
Transition and conversion trim-maps for the AV-8A VTOL aircraft [AD-A102155] N81-31188
A model-following technique for insensitive aircraft control systems N81-31223
FLIGHT CREWS
Information transfer within the cockpit: Problems in intracockpit communications N81-31167
Hearing standards for aircrew N81-31461
An active noise reduction system for aircrew helmets N81-31470
Training for relaxation. An experiment at the military flight school [FOA-C-59003-H9] N81-31841
Personal visual aids for aircrew [AGARD-LS-115] N81-31849
Eye protection and tinted lenses N81-31852
Problems arising from the wearing of head equipment N81-31853
Lasers and protection of the eyes N81-31854
FLIGHT FITNESS
Non-invasive evaluation of the coronary circulation N81-31828
NATO regulations on the cardio-vascular system N81-31829
The application of cardiograms in the valuation of navigation personnel N81-31830
Principal electrocardiographic anomalies in the valuation of navigation personnel N81-31832
FLIGHT INSTRUMENTS
Review of AIDS development --- airborne computers for reliability engineering N81-31212
FLIGHT LOAD RECORDERS
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980 [AD-A102495] N81-31187
FLIGHT OPERATIONS
Information transfer between air traffic control and aircraft: Communication problems in flight operations N81-31166
Information transfer during contingency operations: Emergency air-ground communications N81-31168
FLIGHT PATHS
Minimum noise impact aircraft trajectories [NASA-CR-164719] N81-31159
FLIGHT SAFETY
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
Hearing impaired aviators in the U.S. Army N81-31471
FLIGHT SIMULATION
Advanced multiple processor configuration study [AD-A101919] N81-31868
FLIGHT SIMULATORS
The effects of various fidelity factors on simulated helicopter hover [AD-A102028] N81-31232
BIOCONAID system (bionic control of acceleration induced dimming) [AD-A102510] N81-31234
Flight simulator: Use of spacegraph display in an instructor/operator station [AD-A101951] N81-31235
FLIGHT STABILITY TESTS
Dynamic Stability Parameters --- conferences [AGARD-LS-114] N81-31105
FLIGHT TRAINING
Training for relaxation. An experiment at the military flight school [FOA-C-59003-H9] N81-31841

FLORIDA
Florida's renewable energy potential
[GPO-68-757] N81-31637
Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789
Convective cloud modification potential in Illinois compared with that for south Florida and deduced from soundings and cloud physics measurements
[PB81-198681] N81-31798
FLOW CHARACTERISTICS
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Research program of the Special Research Division 80, 1981 to 1983 --- propagation and transport phenomena in flows
[KU-SFB-80/A/166] N81-31521
FLOW DISTRIBUTION
Propeller propulsion integrataion, phase 2
[NASA-CR-164730] N81-31125
Stall flutter experiment in a transonic oscillating linear cascade
[NASA-TM-82655] N81-31126
Three-dimensional transonic flow analysis
[AD-A101944] N81-31153
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154
Far field conditions in steady flows with a free stream Mach number one
[AD-A102174] N81-31155
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
FLOW MEASUREMENT
Aeroelastic instability stoppers for wind-tunnel models
[NASA-CASE-LAR-12720-1] N81-31229
A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547
Laser Doppler anemometry and its application to flow measurements --- numerical flow computation aided by anemometry N81-31995
FLOW STABILITY
The NTF as a national facility N81-31132
NTF and the Department of Defense N81-31133
Aeroelastic instability stoppers for wind-tunnel models
[NASA-CASE-LAR-12720-1] N81-31229
Influence of transverse magnetic fields --- and rotation on Marangoni-convection in crystal melts N81-32004
FLOW VELOCITY
Hamilton Standard Superjet solid state fluidic rate sensor N81-31176
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662
FLOW VISUALIZATION
Theoretical and experimental investigation of coherent structure in the turbulent boundary layer
[AD-A102368] N81-31511
FLUCTUATION THEORY
Some aspects of fluctuating vertical wind shears
[PNL-3771] N81-31792
FLUID DYNAMICS
Report of the panel on fluid dynamics N81-31146
Scientific report of the Research Department for Fluid Dynamics N81-31520
Research program of the Special Research Division 80, 1981 to 1983 --- propagation and transport phenomena in flows
[KU-SFB-80/A/166] N81-31521
A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547
CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645
FLUID FILLED SHELLS
Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 2
[NASA-CR-161841] N81-31634
FLUID FLOW
GRID3D: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128
Corrosion and stress corrosion cracking of type 304 stainless steel and carbon steel in simulated boiling water reactor N81-31336
FLUID MECHANICS
The effect of body forces on the motion and heat transfer of confined fluids
[AD-A102042] N81-31512
FLUIDICS
Hamilton Standard Superjet solid state fluidic rate sensor N81-31176
FLUIDIZED BED PROCESSORS
Lignite combustion test project summary report
[DOE/FC-02030/T1] N81-31323
FLUORESCENCE
Laser excited fluorescence as a plasma probe: Stochastic interpretations of preliminary experimental observations N81-31303
Fluorescent probes in the solid state and their application to inorganic ion determinations N81-31305
Oceanic Lidar
[NASA-CP-2194] N81-31801
FLUOROCARBONS
Ozone depletion calculations
[UCRL-85814] N81-31730
FLYING PERSONNEL
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
Non-invasive evaluation of the coronary circulation N81-31828
NATO regulations on the cardio-vascular system N81-31829
The application of cardiograms in the valuation of navigation personnel N81-31830
Echocardiography in aviation medicine N81-31831
Principal electrocardiographic anomalies in the valuation of navigation personnel N81-31832
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
Disposition of electrocardiographic abnormalities in aviation N81-31838
Conventional optical correction of ametropias in aeronautics N81-31850
The indications of the use of contact lenses in aeronautics N81-31851
Problems in aeronautics posed by visual deficiencies N81-31855
FLYWHEELS
Toward optimization of the woven flywheel
[UCRL-15359] N81-31294
FORCE DISTRIBUTION
Evaluation of Ting's method for the calculation of the lift distribution on a wing in propulsive jets
[NLR-TR-80078-U] N81-31157
FORCED VIBRATION
Direct forced-oscillation techniques for the determination of stability derivatives in wind tunnels N81-31109
FORECASTING
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
A numerical model study of long-term planetary wave predictability N81-31710
FORMALISM
Synchronization: A formal approach N81-31871
Abstract storage structures --- programming languages, abstract data types
[MC-IW-158/81] N81-31901
FORMULAS (MATHEMATICS)
Compact deferred correction formulas
[TRITA-NA-8007] N81-31918
FORTRAN
FAVS enhancements
[AD-A102218] N81-31883
FOULING
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809
FRACTURE MECHANICS
Fracture and fatigue of bi-materials
[AD-A102344] N81-31293
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels. Part 1: Literature assessment
[SAND-80-0732-PT-1] N81-31349
Nondestructive evaluation of path-independent integrals in fracture mechanics N81-31570
The continuous damage theory of brittle materials and its applications in plane problems N81-31575
Stress-intensity factor equations for cracks in three-dimensional finite bodies
[NASA-TM-83200] N81-31578
FRACTURE STRENGTH
Ductile fracture toughness determined on an energy basis using polycarbonate N81-31563
A diffusive crack growth model for creep fractures
[PB81-196883] N81-31591
FRACTURES (MATERIALS)
Development of fracture toughness measurement capability by ultrasound
[BDX-613-2625] N81-31586
FRACTURING
Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346
The application of optical fibers for monitoring devices for the detection of plastic strain and cracking
[NMI-R-72] N81-32020
FREDHOLM EQUATIONS
Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415
A higher order theory for the potential flow about thin hydrofoils N81-31502
FREE BOUNDARIES
A higher order theory for the potential flow about thin hydrofoils N81-31502
FREE CONVECTION
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503
FREE ELECTRON LASERS
Bandwidth and frequency enhancement of free electron laser in a mildly relativistic electron beam
[AD-A102164] N81-31538
High power submillimeter and infrared radiation from intense relativistic electron beams
[AD-A102487] N81-31541
FREE FLIGHT TEST APPARATUS
Wall interference effects: Status review N81-31141
FREE RADICALS
Reactions of free radicals with nitro-compounds and nitrates
[AD-A102286] N81-31314
FRENCH SATELLITES
SNIAS and the world market for application satellites --- television and communication satellites
[SNIAS-802-422-106] N81-31270
FREQUENCY ANALYZERS
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
Oscillator monitor
[EGG-1183-1802] N81-31532
FREQUENCY CONTROL
High stability buffered phase comparator
[NASA-CASE-GSC-12645-1] N81-31482
FREQUENCY DIVIDERS
Unequal split microwave power divider
[NASA-CASE-LAR-12889-1] N81-31483
FREQUENCY DIVISION MULTIPLEXING
Coexistence of one or more frequency shift keying modulation numerical channels with frequency division multiplexing-frequency modulation networks at 4, 6 and 7 GHz
[FUB-4-1981] N81-31447
FREQUENCY MODULATION
Adaptive control system for line-commutated inverters
[NASA-CASE-MFS-25209-1] N81-31480

FREQUENCY SHIFT KEYING
Coexistence of one or more frequency shift keying modulation numerical channels with frequency division multiplexing-frequency modulation networks at 4, 6 and 7 GHz
[FUB-4-1981] N81-31447
FRICTION FACTOR
Development of an autonomous experiment on the measurement of friction losses of pneumatic transport under reduced gravity N81-31246
FUEL CONSUMPTION
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane
[NASA-CR-165768] N81-31184
CF 6 engine diagnostics N81-31197
JT8D engine performance retention N81-31200
Performance deterioration: An airline perspective N81-31202
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile
[NASA-CR-165281] N81-32088
Dynamometer and track measurement of passenger car fuel economy
[PB81-196446] N81-32092
FUEL PRODUCTION
Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379
Synthetic fuel oversight hearing
[GPO-76-079] N81-31382
Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
FUEL SPRAYS
Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221
FUEL TANKS
Storage of fluids and fuels in large tanks under zero gravity N81-32007
FUELS
Cogeneration
[GPO-68-746] N81-31638
FUNCTIONAL ANALYSIS
An LCAO local density functional approach to surface electronic structure calculations --- thin films N81-32048
FUSION REACTORS
Status of the US heavy ion fusion program
[SLAC-PUB-2722] N81-32035
Status of the Tokamak program
[ORNL/TM-7778] N81-32039

G

GALACTIC RADIATION
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113
GALLIUM ARSENIDE LASERS
Design of a laser system for instantaneous location of a longwall shearer
[NASA-CR-161846] N81-31607
GALLIUM ARSENIDES
Two-dimensional simulation of GaAs MESFETS using the finite element method N81-31479
Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623
Electron device contact studies --- contacts to gallium arsenides
[AD-A102088] N81-32061
GAMMA RAY SPECTROMETERS
Limits of studying high-spin states by discrete-line Gamma-ray spectroscopy
[CONF-8006160-1] N81-31321
GAMMA RAYS
Infinite gamma device program
[NASA-CR-166707] N81-31476
GAS ANALYSIS
Carbon and hydrogen gases in hydrothermal systems: The search for a mantle source N81-31715
GAS COMPOSITION
Direct method determination of the gas content of coal: Procedures and results
[PB81-196735] N81-31401
GAS DISCHARGE TUBES
Gas-discharge matrix display --- with inherent memory
[BMFT-FB-T-80-082] N81-31492
Development of an electrostatic printing process with gas discharge recording writing head
[BMFT-FB-T-80-084] N81-31494
GAS FLOW
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399
GAS TURBINE ENGINES
An introduction to NASA's turbine engine hot section technology (HOST) project N81-31206
GAS TURBINES
An overview of SAE ARP 1587: Aircraft gas turbine engine monitoring system guide N81-31217
Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221
High temperature turbine technology program. Phase 2: Technology test and support studies
[CW-WR-76-02086] N81-31554
Development and validation of reliability forecast techniques for selected thermomechanical components of gas-turbine combined-cycle plants: Guidelines for making reliability forecasts
[EPRI-AP-1848] N81-31664
GAS-LIQUID INTERACTIONS
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503
GAS-METAL INTERACTIONS
Onset of condensation effects in cryogenic wind tunnels N81-31139
GASEOUS FUELS
Flame propagation in gaseous fuel mixtures in semiconfined geometries
[UCID-19000] N81-31324
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
GASES
Electron energy-distribution functions in gases
[CONF-810720-1] N81-31972
GASOHOL (FUEL)
Alcohol fuels
[GPO-70-454] N81-31384
Impact of gasohol on automobile evaporative and tailpipe emissions
[PB81-199952] N81-31400
GASOLINE
Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379
GATES (CIRCUITS)
Optical triggering of power thyristors
[BMFT-FB-T-80-083] N81-31493
Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065
GAUGE THEORY
Hyperpions at the Z(0)
[DOE/ER-01545/306] N81-31968
GAUSS-MARKOV THEOREM
Optimal point process estimators for Gaussian optical field intensities N81-31989
GEOCHEMISTRY
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713
Structural chemistry of the marine manganate minerals N81-31714
GEOCHRONOLOGY
Beryllium-10 as a potential probe of solar variability influence on climate N81-31772
GEODESY
On the compensation of geoid anomalies due to subducting slabs
[NASA-TM-82157] N81-31721
On the numerical analysis of the weight optimization of geodetic nets --- second order design
[SER-C-256] N81-31734
LAMMR world data base documentation support and demonstrations
[NASA-CR-166706] N81-32073
GEODETIC SURVEYS
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
GEODYNAMICS
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733
GEOIDS
On the compensation of geoid anomalies due to subducting slabs
[NASA-TM-82157] N81-31721
GEOLOGICAL FAULTS
Cross-strike structural discontinuties-tear faults and transfer zones in the central Appalachians of West Virginia N81-31712
GEOLOGY
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
GEOMAGNETIC TAIL
Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963
GEOMAGNETISM
Study of geomagnetic storms, solar flares, and centers of activity in 1977
[AD-A102301] N81-32109
GEOMETRICAL OPTICS
Mode theory for an equilateral triangular dielectric waveguide N81-31478
GEOMETRY
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128
GEOMORPHOLOGY
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
Development and present state of German periglacial research in the polar, subpolar and alpine environment
[NRC/CNR-TT-1983] N81-31747
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791
GEOPOTENTIAL
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along lattitude 50 N for summer and winter, series A monographs --- including geostrophic winds
[ISSN-0342-4324] N81-31741
GEOSTROPHIC WIND
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along lattitude 50 N for summer and winter, series A monographs --- including geostrophic winds
[ISSN-0342-4324] N81-31741
GEOTHERMAL ENERGY CONVERSION
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662
GEOTHERMAL ENERGY EXTRACTION
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems, volume 1 --- modeling geothermal drilling costs
[SAND-80-7154/1-VOL-1] N81-31898
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems. Volume 2: Subprogram description --- geothermal drilling
[SAND-80-7154/2-VOL-2] N81-31899
GEOTHERMAL RESOURCES
Resource assessment of low- and moderate-temperature geothermal waters in Calistoga, Napa County, California. Report of the second year, 1979 to 1980 of the US Department of Energy - California State-Coupled Program for reservoir assessment and confirmation
[DOE/ET-27035/T1] N81-31609
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611
CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662

GERMANIUM
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
GERMANIUM COMPOUNDS
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines [DOE/ER-03416/21] N81-31325
GERMANY
Meteorological data. Volume 3, number 4: Comparative investigation between the climate prevailing during the full 24-hour day and that during the nine-hour working day (7 a.m. - 4 p.m.) in Berlin, series A monographs [ISSN-0342-4324] N81-31742
GERT
Circle graphs N81-31872
GLACIERS
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775
GLACIOLOGY
Development and present state of German periglacial research in the polar, subpolar and alpine environment [NRC/CNR-TT-1983] N81-31747
GLASS
Reaction kinetics in molten glasses N81-31265
Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306
GLASS FIBERS
National Transonic Facility Fan Blade prepreg material characterization tests [NASA-TM-81800] N81-31227
Thermal expansion properties of composite materials [NASA-CR-165632] N81-31576
Stability characteristics of epoxy-impregnated superconducting magnets [AD-A102419] N81-31953
GOLD
DC sputter gold deposition on beryllium-copper contacts [BDX-613-2629] N81-31348
GOODNESS OF FIT
Characterizations and goodness of fit tests [AD-A102167] N81-31943
GOVERNMENT/INDUSTRY RELATIONS
Proceedings of the Symposium: Perspectives on Scientific and Technical Information [ORNL-5749] N81-32076
Space Benefits: The secondary application of aerospace technology in other sectors of the economy [NASA-CR-164733] N81-32086
GRAIN BOUNDARIES
Investigation of photoelectrochemical corrosion of semiconductors [SERI/TR-8002-6-T1] N81-31347
A diffusive crack growth model for creep fractures [PB81-196883] N81-31591
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052
GRAINS (FOOD)
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment [E81-10206] N81-31597
GRAMMARS
From Van Wijngaarden-grammar to ALEPH --- programming languages, hierarchies [MC-IW-162/81] N81-31903
GRAPHITE
Silicone modified resins for graphite fiber laminates [NASA-CR-165451] N81-31290
Graphite reinforced thermoplastic composites [AD-A102217] N81-31292
Factors affecting graphite morphology, matrix structure and tensile properties of compacted graphite cast irons N81-31331
GRAPHITE-EPOXY COMPOSITE MATERIALS
Fillers for improved graphite fiber retention by polymer matrix composites [NASA-CR-165437] N81-31288
Failure of morphology of (0 deg)8 graphite/epoxy as influenced by environments and processing [NASA-TM-81318] N81-31289
Hybridized polymer matrix composites [NASA-CR-165339] N81-31361
Thermal expansion properties of composite materials [NASA-CR-165632] N81-31576
GRAPHITE-POLYIMIDE COMPOSITES
Hybridized polymer matrix composites [NASA-CR-165339] N81-31361
GRAPHS (CHARTS)
Circle graphs N81-31872
GRAVITY ANOMALIES
Satellite To Satellite Doppler Tracking (SSDT) for mapping of the Earth's gravity field [NASA-CR-164722] N81-31601
On the compensation of geoid anomalies due to subducting slabs [NASA-TM-82157] N81-31721
GRAVITY WAVES
A numerical model study of long-term planetary wave predictability N81-31710
GREAT LAKES (NORTH AMERICA)
Mariners weather log, volume 24, number 6, November-December 1980 [PB81-195372] N81-31795
GREENHOUSES
Solar energy model Goennebek. Development and planning of a self-supporting heating plant for greenhouses [BMFT-FB-T-80-119] N81-31673
GREENLAND
Ice sheet altimetry [NASA-CR-156877] N81-31605
GROUND STATE
Electronic phenomena at high pressure [DOE/ER-01198/1350] N81-31488
GROUND TRUTH
Satellite measurements of tropospheric aerosols [NASA-CR-3459] N81-31680
GROUND WATER
Essentials of ground-water hydrology pertinent to water-resources planning [BULL-16-REV] N81-31606
Water resources data for Maryland and Delaware, water year 1980 [PB81-195885] N81-31616
Geohydrology of the Delta-Clearwater Alaska [PB81-200651] N81-31621
Interchange of pollutants between groundwater and and mineral strata as applied to waste chemical dumps and in situ coal gasification sites [PB81-198335] N81-31697
GROUND-AIR-GROUND COMMUNICATIONS
Information transfer problems in the aviation system [NASA-TP-1875] N81-31162
Dimensions of the information transfer problem --- human performance N81-31163
Information transfer in the surface component of the system: Problems associated with briefing of relief controllers N81-31164
Information transfer in the surface component of the system: Coordination problems in air traffic control N81-31165
Information transfer between air traffic control and aircraft: Communication problems in flight operations N81-31166
Information transfer during contingency operations: Emergency air-ground communications N81-31168
The information transfer problem summary and comments N81-31169
GULF OF MEXICO
Improved weather services for helicopter operations in the Gulf of Mexico [AD-A102209] N81-31786
GUNS (ORDNANCE)
Electromagnetic theta gun and tubular projectiles [SAND-80-1988] N81-31490
GUST LOADS
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity [NLR-TR-79121-U] N81-31589
GYPSUM
Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin [PB81-197626] N81-31737
GYROSCOPES
Advances in inertial navigation systems and components [AGARD-AG-254] N81-31172
Tuned gyro cost reduction through a novel hinge design N81-31173
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175

H

HABITATS
Vertebrate behavior and ecology [DOE/EV-01332/T1] N81-31684
HALF SPACES
Thermal shocking an elastic half-space with a laser pulse N81-31562
HALL ACCELERATORS
High B-field, large area ratio MHD duct experiments [NASA-TM-82673] N81-32026
HANDBOOKS
Digital spectral analysis: A guide based on experience with aircraft vibration [RAE-TR-81014] N81-31588
HANDWRITING
Cursive script word recognition N81-31878
HARDENING (MATERIALS)
The separate roles of forest dislocations and subgrains in the isotropic hardening of type 304 stainless steel N81-31334
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
HARRIER AIRCRAFT
Transition and conversion trim-maps for the AV-8A VTOL aircraft [AD-A102155] N81-31188
HARTREE APPROXIMATION
Theoretical calculations of the electronic and vibrational structure of point defects in ionic crystals [CONF-810573-1(DRAFT)] N81-32067
HAWAII
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
Maui optical site, Mount Haleakualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F [AD-A102394] N81-31788
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands [PB81-199598] N81-31805
HAZARDS
The effect of noise on the vestibular system N81-31455
Hearing conservation N81-31472
HEAD (ANATOMY)
Dynamics of two-dimensional eye-head tracking [AD-A102369] N81-31842
HEAD-UP DISPLAYS
The effects of various fidelity factors on simulated helicopter hover [AD-A102028] N81-31232
HEALTH PHYSICS
Health effects of low-level radiation [CONF-810606-47] N81-31824
HEARING
Hearing standards for aircrew N81-31461
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469
HEART DISEASES
Prevention of cardiovascular diseases N81-31836
Cardiovascular problems during the pilots career N81-31837
HEART FUNCTION
Echocardiography in aviation medicine N81-31831
Principal electrocardiographic anomalies in the valuation of navigation personnel N81-31832
HEAT EXCHANGERS
Ocean thermal energy conversion power system development-2, phase 2 [DOE/ET-21056/T3] N81-31651

Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant
[SAND-80-8190] N81-31657

HEAT MEASUREMENT
Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306

HEAT PUMPS
Performance analysis of dedicated heat-pump water heaters in an office building
[SERI/TP-721-1198] N81-31404
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668

HEAT RESISTANT ALLOYS
Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204
Advanced turbine blade tip seal system N81-31205
An introduction to NASA's turbine engine hot section technology (HOST) project N81-31206
Conservation of Strategic Aerospace Materials (COSAM) N81-31208
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339
Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355

HEAT STORAGE
Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 2
[NASA-CR-161841] N81-31634
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant
[SAND-80-8190] N81-31657
Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666

HEAT TRANSFER
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501
Heat transfer in developing laminar pipe flow: With or without a phase change material around the pipe N81-31504
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506
Development and heat transfer analysis of direct coal fired MHD combustors
[DOE/ET-10815/T4] N81-31518
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622

HEAT TREATMENT
Development and validation of reliability forecast techniques for selected thermomechanical components of gas-turbine combined-cycle plants: Guidelines for making reliability forecasts
[EPRI-AP-1848] N81-31664

HEATING
Comparison between the heat loss and heat gain through the lungs and body surface during hypothermia and its treatment
[DRIC-T-6307] N81-31825

HEAVY IONS
Status of the US heavy ion fusion program
[SLAC-PUB-2722] N81-32035

HEAVY LIFT HELICOPTERS
Vehicle concepts and technology requirements for buoyant heavy-lift systems
[NASA-TP-1921] N81-31185

HELICOPTER CONTROL
The effects of various fidelity factors on simulated helicopter hover
[AD-A102028] N81-31232

HELICOPTER DESIGN
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459

HELICOPTER ENGINES
Prevention of corrosion and fatigue failure of helicopter gas turbine compressors
[NLR-MP-80024-U] N81-31222

HELICOPTERS
Helicopter propulsion system reliability and engine monitoring assessments N81-31213

HELIOSTATS
Solar central receiver heliostat mirror module development
[SAND-79-8189] N81-31656
Second-generation heliostat detail design report
[SAND-78-8192] N81-31663

HELIUM ATOMS
Monte Carlo calculation of the Born-Oppenheimer potential between two helium atoms N81-31960

HELIUM ISOTOPES
Transverse acoustic impedance of normal liquid He-3 N81-32060

HELIUM PLASMA
Nanosecond CO2 laser interaction with a dense helium Z-pinch plasma N81-32024

HELMETS
An active noise reduction system for aircrew helmets N81-31470
Flying helmet attenuation, and the measurement, with particular reference to the Mk 4 helmet N81-31473
Problems arising from the wearing of head equipment N81-31853

HEMATOLOGY
Metabolism of hydrazine
[AD-A101849] N81-31818

HEPTANES
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501

HF LASERS
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535

HIERARCHIES
From Van Wijngaarden-grammar to ALEPH --- programming languages, hierarchies
[MC-IW-162/81] N81-31903

HIGH CURRENT
High-current, short-pulse, RF-synchronized electron gun for the Stanford Linear Accelerator
[SLAC-PUB-2705] N81-31980

HIGH ENERGY INTERACTIONS
Modelling penetration by slender high kinetic energy projectiles
[MRL-R-811] N81-31546

HIGH FREQUENCIES
Design and implementation of project 7140 wideband HF communication test facility
[AD-A102261] N81-31424
HF/UHF low-loss nanosecond variable delay lines
[AD-A102271] N81-31431

HIGH LEVEL LANGUAGES
The design of a high-level coroutine implementation for the production of quality software N81-31873
Communicating distributed processes: A programming language concept for distributed systems N81-31874
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904

HIGH PRESSURE
Structure of H2-02 flames under pressure
[AD-A102108] N81-31312
Electronic phenomena at high pressure
[DOE/ER-01198/1350] N81-31488

HIGH RESOLUTION
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528

HIGH SPEED
High speed multiplex bus protocol study
[AD-A102113] N81-31191
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549

HIGH STRENGTH ALLOYS
Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192

HIGH TEMPERATURE
Spectral emissivity at high temperatures
[AD-A101949] N81-31311

HIGH TEMPERATURE TESTS
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295
Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318
High temperature mechanical properties of polyphase ceramics based on silicon nitride
[AD-A102121] N81-31372
Thermal shocking an elastic half-space with a laser pulse N81-31562

HIGH VOLTAGES
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023

HINGES
Tuned gyro cost reduction through a novel hinge design N81-31173

HOLE DISTRIBUTION (MECHANICS)
Development of an orthotropic hole element
[NASA-CR-165759] N81-31580

HOLES (ELECTRON DEFICIENCIES)
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054

HOLOGRAPHY
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530
Achromatic coherent optical systems for information processing and holography N81-31986

HOMOGENEOUS TURBULENCE
Numerical experiments in homogeneous turbulence
[NASA-TM-81315] N81-31508

HONEYCOMB STRUCTURES
Fracture and fatigue of bi-materials
[AD-A102344] N81-31293
Solar central receiver heliostat mirror module development
[SAND-79-8189] N81-31656

HOT CORROSION
Electrode polarization studies in hot corrosion systems --- molten salt electrolytes N81-31337

HOVERING
The effects of various fidelity factors on simulated helicopter hover
[AD-A102028] N81-31232

HUMAN BEHAVIOR
Neuronal adaptive mechanisms underlying intelligent information processing
[AD-A101908] N81-31843

HUMAN FACTORS ENGINEERING
Predicting the impacts of new technology aircraft on international air transportation demand
[NASA-CR-165654] N81-31160
On the application of a TV-multipoint x-y tracker to the measurement of the transmissibility of human vibration --- a mechanical impedance model N81-31846
Eye protection and tinted lenses N81-31852
Problems arising from the wearing of head equipment N81-31853
Lasers and protection of the eyes N81-31854
Human performance in continuous operations: Description of a simulation model and user's manual for evaluation of performance degradation
[AD-A101950] N81-31856
Man and machine. An ergonometric perspective on various abilities, objectives and work patterns in the development of the system
[FOA-C-56020-H9] N81-31857

HUMAN FACTORS LABORATORIES
Voice communication research and evaluation system N81-31450

HUMAN PERFORMANCE
Information transfer problems in the aviation system
[NASA-TP-1875] N81-31162
Dimensions of the information transfer problem --- human performance N81-31163
Information transfer in the surface component of the system: Problems associated with briefing of relief controllers N81-31164
In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819

The effects of gender and instructions on calibration
[AD-A102255] N81-31844
Human performance in continuous operations: Description of a simulation model and user's manual for evaluation of performance degradation
[AD-A101950] N81-31856

HUMAN REACTIONS
The speed of response to synthesized voice messages N81-31456
Voice warning systems: Some experimental evidence concerning application N81-31458

HUMIDITY
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts
[PB81-198293] N81-31797

HUMIDITY MEASUREMENT
Maui optical site, Mount Halekualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F
[AD-A102394] N81-31788
Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789

HURRICANES
Tropical cyclones (1980): Central Pacific
[PB81-198699] N81-31799

HYDRAULIC EQUIPMENT
A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547

HYDRAULIC FLUIDS
Air uptake and air release behavior of lubricating oils and hydraulic fluids
[DGMK-31] N81-31376

HYDRAZINE NITRATE
Metabolism of hydrazine
[AD-A101849] N81-31818

HYDROCARBONS
Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases
[DOE/ET-14809/6] N81-31322
Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711

HYDROCLIMATOLOGY
Hydro-climatic variability in the equatorial Atlantic Correlation with solar activity N81-31756

HYDRODYNAMICS
Hydrodynamic stability of thin films N81-31505

HYDROELECTRIC POWER STATIONS
Net energy of seven small-scale hydroelectric power plants
[ORNL/TM-7694] N81-31649

HYDROFLUORIC ACID
The reaction of HF with polyacetylene
[AD-A102293] N81-31310

HYDROFOILS
A higher order theory for the potential flow about thin hydrofoils N81-31502

HYDROGEN
Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192
Hydrogen in metals N81-31335
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099

HYDROGEN EMBRITTLEMENT
Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346

HYDROGEN IONS
Comparison of measured emittance of an h(-) ion beam with a simple theory
[LA-8808-MS] N81-31974

HYDROGEN MASERS
Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537

HYDROGEN OXYGEN FUEL CELLS
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells
[ANL/OEPM-80-8] N81-31654

HYDROGEN PLASMA
Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537

HYDROGEOLOGY
Geohydrology of the Delta-Clearwater Alaska
[PB81-200651] N81-31621
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622
Structural chemistry of the marine manganate minerals N81-31714

HYDROGRAPHY
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803

HYDROLOGY
Research program of the Special Research Division 80, 1981 to 1983 --- propagation and transport phenomena in flows
[KU-SFB-80/A/166] N81-31521
Essentials of ground-water hydrology pertinent to water-resources planning
[BULL-16-REV] N81-31806

HYDROLOGY MODELS
Water resources data for Maryland and Delaware, water year 1980
[PB81-195885] N81-31616

HYDROLYSIS
Development of silane-hydrolysate binder for UV-resistant thermal control coatings
[NASA-TP-1900] N81-31365

HYDROTHERMAL SYSTEMS
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622
Carbon and hydrogen gases in hydrothermal systems: The search for a mantle source N81-31715

HYPERTENSION
Cardiovascular problems during the pilots career N81-31837

HYPOTHERMIA
Comparison between the heat loss and heat gain through the lungs and body surface during hypothermia and its treatment
[DRIC-T-6307] N81-31825

I

ICE FORMATION
National icing facilities requirements investigation
[AD-A102520] N81-31238

ICE MAPPING
Ice sheet altimetry
[NASA-CR-156877] N81-31605
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796

IDAHO
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706

IGNITION
Confinement requirements for chmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030

ILLINOIS
Convective cloud modification potential in Illinois compared with that for south Florida and deduced from soundings and cloud physics measurements
[PB81-198681] N81-31798

ILMENITE
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354

IMAGE DISSECTOR TUBES
On the application of a TV-multipoint x-y tracker to the measurement of the transmissibility of human vibration --- a mechanical impedance model N81-31846

IMAGE FURNACES
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354

IMAGE PROCESSING
A technique for line extraction from LANDSAT multi-spectral scanner satellite data with some applications of the technique
[RAE-TR-81010] N81-31613
Image understanding research
[AD-A102471] N81-31893
Cellular architectures: From automata to hardware --- image processing
[AD-A102059] N81-31907
Edge-based texture measures
[AD-A102060] N81-31908
Experience with generalized Hough Transform
[AD-A102222] N81-31913
On an estimation scheme for Gauss Markov random field models --- image processing
[AD-A102057] N81-31938
Generalized Blomqvist correlation --- detecting edges in computer image processing
[AD-A102058] N81-31939
Analysis of an electro-optical satellite observation
[AD-A102514] N81-32014

IMAGE RECONSTRUCTION
Image understanding research
[AD-A102471] N81-31893

IMAGERY
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting
[AD-A102309] N81-31802

IMAGES
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics
[FOA-C-53004-H9] N81-31845

IMIDES
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-1] N81-31364

IMPACT ACCELERATION
In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819

IMPACT DAMAGE
RSV for aluminum
[FOA-C-20348-D4] N81-31341

IMPACT LOADS
The analysis and design of shock absorbers with constant deceleration for variable loading N81-31548

IMPACT PREDICTION
A regression analysis model with some transformations of the variables involved --- application to impact prediction
[FOA-C-20332-D8] N81-31917

IMPACT TESTS
RSV for aluminum
[FOA-C-20348-D4] N81-31341

IMPEDANCE
Moment method solutions for radiation and scattering from arbitrarily shaped surfaces N81-31416

IMPEDANCE MATCHING
Monolithic lumped element integrated circuit (M2LEIC) transistors
[AD-A102334] N81-31485

IMPERIAL VALLEY (CA)
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604

IMPLOSIONS
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator
[LA-UR-81-1442] N81-32029

IMPREGNATING
Stability characteristics of epoxy-impregnated superconducting magnets
[AD-A102419] N81-31953

IMPURITIES
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047

IN-FLIGHT MONITORING
Who needs engine monitoring? N81-31209
F100 engine diagnostic system status to date N81-31210

INCLUSIONS
Living with defects in powder metallurgy materials --- turbine blades
[PNR-90065] N81-31352
INCOHERENT SCATTERING
Interpreting electron temperature changes in the lower ionosphere N81-31705
INCOMPRESSIBLE BOUNDARY LAYER
Boundary layers with strong interaction: From asymptotic theory to calculation method
[NLR-MP-80015-U] N81-31524
The calculation of incompressible boundary layers with strong viscous-inviscid interaction
[NLR-MP-80032-U] N81-31525
INCOMPRESSIBLE FLUIDS
Numerical experiments in homogeneous turbulence
[NASA-TM-81315] N81-31508
INDEPENDENT VARIABLES
Almost sure convergence of adaptive identification prediction and control algorithms
[AD-A102041] N81-31905
A parametric analysis of structured and unstructured Q-sort data
[AD-A102169] N81-31944
INDIUM
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047
INDIUM ANTIMONIDES
Advanced nSb monolithic Charge Coupled Infrared Imaging Devices (CCIRID)
[NASA-CR-165766] N81-31990
INDUCTANCE
Development of a 600 kV Marx module for a high-donsity z-pinch experiment
[LA-UR-81-1584] N81-32033
INDUCTION MOTORS
Small hydro plant development program
[DOE/ID-01570/T21-VOL-2-APP-A-K] N81-31652
INDUSTRIAL AREAS
A dynamic model of the urban process
[PB81-196990] N81-31694
INDUSTRIAL PLANTS
Controlling sulfur oxides
[PB81-200800] N81-31700
INDUSTRIAL SAFETY
The use of inductive position switches in personnel safety systems
[FOA-C-30166-E5] N81-31170
Hearing conservation N81-31472
INDUSTRIES
Industrial innovation
[GPO-70-074] N81-31403
INERTIAL CONFINEMENT FUSION
Status of the US heavy ion fusion program
[SLAC-PUB-2722] N81-32035
Particle beam fusion
[SAND-80-2500] N81-32038
INERTIAL NAVIGATION
Advances in inertial navigation systems and components
[AGARD-AG-254] N81-31172
Inertial system alignment and calibration on a moving base N81-31178
Identification and determination of strapdown error-parameters by laboratory testing N81-31179
INERTIAL PLATFORMS
optical rotation rate sensors N81-31174
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175
INFILTRATION
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
INFORMATION DISSEMINATION
Transfer of information from researcher to consumer: Choosing the appropriate media
[SERI/TP-513-1193] N81-32077
NASA Tech Briefs Index, 1980, vol. 5 nos. 1-4 --- bibliography
[NASA-SP-5021(22)] N81-32085
INFORMATION FLOW
Dimensions of the information transfer problem --- human performance N81-31163
INFORMATION MANAGEMENT
Proceedings of the Symposium: Perspectives on Scientific and Technical Information
[ORNL-5749] N81-32076
INFORMATION RETRIEVAL
Operation of the Metals and Ceramics Information Center
[AD-A102212] N81-31371
How to investigate the copyright status of a work
[CIRCULAR-R22] N81-32084
INFORMATION SYSTEMS
Seismic data analysis center
[AD-A102537] N81-31724
An approach to the generation of software life cycle support systems N81-31877
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
Design of the CSIN (Chemical Substances Information Network) User Services Office
[PB81-196362] N81-32080
INFORMATION THEORY
Modeling and performance optimization of large-scale data-communication networks
[AD-A102341] N81-31437
Covariance operators and their applications in probability and information theory N81-31923
INFRARED DETECTORS
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796
Advanced nSb monolithic Charge Coupled Infrared Imaging Devices (CCIRID)
[NASA-CR-165766] N81-31990
Thermal infrared array, phase 1. Volume 1: Technical
[NASA-CR-166705] N81-31991
INFRARED LASERS
Remote atmospheric measurments with a tunable infrared laser source --- pollution monitoring N81-31985
INFRARED RADIATION
High power submillimeter and infrared radiation from intense relativistic electron beams
[AD-A102487] N81-31541
Satellite identification of surface radiant temperature fields of subpixel resolution
[PB81-184038] N81-31615
Meteorological data. Volume 2, number 2: Synoptic stratopause method for computation of temperature profiles from satellite measurements of the infrared radiation during winter warmings, series A monographs
[ISSN-0342-4324] N81-31740
INFRARED RADIOMETERS
The outlook for precipitation measurements from space
[NASA-TM-82172] N81-31746
INFRARED REFLECTION
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021
INFRARED SPECTRA
Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359
Matrix isolation spectra and structures of unstable molecules N81-31961
The ROSCOE MANUAL. Volume 27: Natural background radiation
[AD-A102524] N81-32016
INFRARED SPECTROMETERS
An instrument to measure the solar spectrum from 170 to 3200 mm on board Spacelab N81-31781
INFRARED SPECTROPHOTOMETERS
Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380
INFRARED SPECTROSCOPY
Color center lasers for infrared spectroscopy N81-31536
INHOMOGENEITY
An investigation of a differential-integral method for calculating electromagnetic scattering by inhomogeneous objects N81-31412
INLET FLOW
Unsteady effects of circumferential pressure distorted inlet flows in compressors
[AD-A102330] N81-31514
INPUT
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems --- digital systems
[FUB-3-1981] N81-31920
INPUT/OUTPUT ROUTINES
Prototype microprocessor controller --- for STDN antennas
[NASA-CR-166703] N81-31861
INSOLATION
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775
INSPECTION
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530
INSTALLING
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting
[NASA-TM-82429] N81-31402
INSTRUMENT ERRORS
Identification and determination of strapdown error-parameters by laboratory testing N81-31179
INTEGRAL EQUATIONS
An investigation of a differential-integral method for calculating electromagnetic scattering by inhomogeneous objects N81-31412
Integral-operator analysis of open-boundary dielectric waveguides N81-31414
A higher order theory for the potential flow about thin hydrofoils N81-31502
Nondestructive evaluation of path-independent integrals in fracture mechanics N81-31570
An algorithm for evaluating the boundary integral equations in planar elasto-plastic bodies N81-31574
INTEGRATED CIRCUITS
Advanced electronic technology
[AD-A102144] N81-31484
Monolithic lumped element integrated circuit (M2LEIC) transistors
[AD-A102334] N81-31485
High-speed GaAs MESFET memory study
[AD-A102252] N81-31863
Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065
INTEGRATED OPTICS
Applications of periodic integrated optical structures in communication circuits --- transmission and signal processing
[REPT-465-TBR-20.] N81-32019
INTEGRATORS
Adaptive control system for line-commutated inverters
[NASA-CASE-MFS-25209-1] N81-31480
INTEL 8080 MICROPROCESSOR
The utilization of microprocessors in real time numerical signal processing --- digital filters
[FUB-49-1979] N81-31870
INTELLIGIBILITY
Aural communication in aviation
[AGARD-CP-311] N81-31449
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
Voice communication capability of selected inflight headgear devices N81-31467
An automated multiple choice intelligibility testing system N81-31468
An active noise reduction system for aircrew helmets N81-31470
INTERATOMIC FORCES
Plastic dislocation motion via nonequilibrium molecular and continuum dynamics
[UCRL-84146] N81-32068
INTERFACE STABILITY
Demonstration of the separation behavior of alloys using transparent model systems --- for zero gravity application N81-31253
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565
Interface convection under microgravity conditions N81-31999
INTERFACIAL TENSION
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503

INTERFEROMETERS
SCRIBE 1 data analysis
[AD-A102262] N81-31315
Introduction to interferometry --- by lasers
N81-31994

INTERFEROMETRY
Introduction to interferometry --- by lasers
N81-31994

INTERMETALLICS
Conservation of Strategic Aerospace Materials (COSAM) N81-31208
De HASS-Van Alphen measurements of one-electron and many-body effects in transition metals and intermetallic compounds
[CONF-800864-2] N81-31345

INTERMOLECULAR FORCES
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070

INTERNAL COMBUSTION ENGINES
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667

INTERNAL WAVES
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow
[NASA-CR-3466] N81-31127

INTERPLANETARY MAGNETIC FIELDS
Solar-geophysical data number 437, January 1981. Part 1: (Prompt Reports) data for December 1980, November 1980 and late data
[PB81-198087] N81-32111
Solar-geophysical data number 437, January 1981. Part 2: (Comprehensive Reports) Data for July 1980 and miscellanea
[PB81-198095] N81-32112

INTERPROCESSOR COMMUNICATION
Modeling and performance optimization of large-scale data-communication networks
[AD-A102341] N81-31437
The design methodology of distributed computer systems
[AD-A102065] N81-31864
Code translation program for Hewlett-Packard computers
[SAND-81-0627] N81-31897

INTERSECTIONS
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566

INTERSTELLAR CHEMISTRY
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen
N81-32113

INTRAMOLECULAR STRUCTURES
Hydrodynamic stability of thin films N81-31505

INVERTERS
Adaptive control system for line-commutated inverters
[NASA-CASE-MFS-25209-1] N81-31480
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481

INVISCID FLOW
Surrogate-equation technique for simulation of steady inviscid flow
[NASA-TP-1866] N81-31129
The calculation of incompressible boundary layers with strong viscous-inviscid interaction
[NLR-MP-80032-U] N81-31525

ION ACCELERATORS
Using an electrostatic accelerator to determine the stereochemical structures of molecular ions
[CONF-801111-43] N81-31964

ION BEAMS
Radiation biophysics research
[LBL-11700] N81-31811
Comparison of measured emittance of an h(-) ion beam with a simple theory
[LA-8808-MS] N81-31974
Particle beam fusion
[SAND-80-2500] N81-32038
A universal solid ion source
[AD-A102321] N81-32063

ION DENSITY (CONCENTRATION)
Electron transport, chemistry and optical emissions in the auroral E-layer
[AD-A102345] N81-31725

ION DISTRIBUTION
The abundance and distribution of chlorine in meteorites N81-32105

ION SOURCES
A universal solid ion source
[AD-A102321] N81-32063

ION TEMPERATURE
Doppler ion program description --- to measure plasma ion temperature
[GA-A-16140] N81-31973
Comparison of measured emittance of an h(-) ion beam with a simple theory
[LA-8808-MS] N81-31974

IONIC CRYSTALS
Theoretical calculations of the electronic and vibrational structure of point defects in ionic crystals
[CONF-810573-1(DRAFT)] N81-32067

IONIC MOBILITY
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622

IONIC REACTIONS
Negative ion/molecule reactions in a negative corona discharge
[UTIAS-TN-230] N81-32027

IONIZING RADIATION
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels
[DOE/EV-10503/1] N81-31815
Toward a theory of the initiation of cancer by ionizing radiation: Track structure analysis for electrons and alpha particles in water
[CONF-800944-8] N81-31821
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826

IONOSPHERE
Computer simulation techniques for artificial modification of the ionosphere
[AD-A102302] N81-31722
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732

IONOSPHERIC COMPOSITION
The ionosphere of Saturn N81-32104

IONOSPHERIC HEATING
Impact of Satellite Power Systems on the ionosphere
[DOE/CH-10003/1] N81-31678

IONOSPHERIC PROPAGATION
Design and implementation of project 7140 wideband HF communication test facility
[AD-A102261] N81-31424

IONS
Fluorescent probes in the solid state and their application to inorganic ion determinations
N81-31305
Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319

IRON ALLOYS
Effect of production conditions on physical and mechanical properties of aluminum with low iron concentrates N81-31330

IRON METEORITES
The abundance and distribution of chlorine in meteorites N81-32105

IRRADIANCE
The solar spectral irradiance 1200-3184 a near solar maximum, 15 July 1980
[NASA-CR-164727] N81-32107

ISOTOPES
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175

ITERATIVE SOLUTION
Surrogate-equation technique for simulation of steady inviscid flow
[NASA-TP-1866] N81-31129
On solving the large sparse generalized eigenvalue problem N81-31859
K-line iterative methods: A conjugate-gradient approach --- two-dimensional parabolic and elliptic difference equations
[LA-UR-81-1409] N81-31916

J

JAMMERS
Voice communications jamming research
N81-31451

JAMMING
Voice communications jamming research
N81-31451

JET AIRCRAFT NOISE
An active noise reduction system for aircrew helmets N81-31470
Presentation to the European Union against Aircraft Nuisances --- jet noise reduction, airports
[PNR-90064] N81-31959

JET ENGINE FUELS
Infrared spectroscopy for the determination of hydrocarbon types in jet fuels
[NASA-TM-82674] N81-31380

JET ENGINES
CF 6 engine diagnostics N81-31197
CF6 high pressure compressor and turbine clearance evaluations N81-31198
JT9D jet engine diagnostics program N81-31199

JET FLOW
Comparison of hot and cold subsonic jets in external flow with reference to jet engine simulation
[NLR-TR-80042-U] N81-31156
Evaluation of Ting's method for the calculation of the lift distribution on a wing in propulsive jets
[NLR-TR-80078-U] N81-31157
Hamilton Standard Superjet solid state fluidic rate sensor N81-31176

JET PROPULSION
Advanced subsonic transport propulsion
[NASA-TM-82696] N81-31195

JET STREAMS (METEOROLOGY)
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745

JOINTS (JUNCTIONS)
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting
[NASA-TM-82429] N81-31402

JUNCTION TRANSISTORS
Power transistor switching characterization
[NASA-CR-164607] N81-31497

JUPITER (PLANET)
Decameter-wave radio observations of Jupiter during the 1977 apparition
[NASA-TM-84012] N81-32095

K

KERR MAGNETOOPTICAL EFFECT
Statistics of noise in photodetection: Applications in magneto-optical recording N81-31477

KINETIC ENERGY
Modelling penetration by slender high kinetic energy projectiles
[MRL-R-811] N81-31546

KINETICS
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052

KNOWLEDGE
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 2: Social meanings of energy
[DOE/TIC-1022360] N81-31647
A knowledge-based design environment for digital electronics N81-31880

KOLMOGOROFF-SMIRNOFF TEST
Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945

KRIGING
Modeling and analysis of air-quality data
[DOE/EV-10428/8] N81-31686

L

LAKE MICHIGAN
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618
Numerical simulation of mesoscale atmospheric circulations over the Lake Michigan area
[CONF-801102-38] N81-31790

LAKES
Precipitation and inactivation of phosphorus as a lake restoration technique
[PB81-196511] N81-31617
Covering bottom sediments as a lake restoration technique
[PB81-200453] N81-31620
LAMINAR BOUNDARY LAYER
Preliminary experimental study of disturbances in a laminar boundary-layer due to distributed surface roughness
[AD-A102072] N81-31513
Boundary layers with strong interaction: From asymptotic theory to calculation method
[NLR-MP-80015-U] N81-31524
The calculation of incompressible boundary layers with strong viscous-inviscid interaction
[NLR-MP-80032-U] N81-31525
LAMINAR FLOW
Heat transfer in developing laminar pipe flow: With or without a phase change material around the pipe N81-31504
LAMINATES
Fillers for improved graphite fiber retention by polymer matrix composites
[NASA-CR-165437] N81-31288
Fracture and fatigue of bi-materials
[AD-A102344] N81-31293
Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299
Hybridized polymer matrix composites
[NASA-CR-165339] N81-31361
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
LAND MANAGEMENT
Barrier Island development near four National seashores
[PB81-196313] N81-31804
LAND USE
A dynamic model of the urban process
[PB81-196990] N81-31694
Resource Conservation and Development Act
[GPO-67-017] N81-32083
LANDING GEAR
Damage tolerance of a landing gear component after many takeoffs and landings --- nondestructive tests
[NLR-MP-79039-U] N81-31189
LANGUAGES
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
LARGE SPACE STRUCTURES
Considerations in the design of large space structures
[NASA-CR-165744] N81-31271
Research on numerical algorithms for large space structures
[NASA-CR-164721] N81-31911
LASER ANNEALING
Growth of HgCdTe by modified molecular beam epitaxy
[AD-A102272] N81-32064
LASER APPLICATIONS
Laser excited fluorescence as a plasma probe: Stochastic interpretations of preliminary experimental observations N81-31303
The four-mode linearly-polarized ring laser gyro N81-31527
Oceanic Lidar
[NASA-CP-2194] N81-31801
Introduction to interferometry --- by lasers N81-31994
LASER CAVITIES
Unstable resonators
[AD-A102071] N81-31540
LASER DAMAGE
Lasers and protection of the eyes N81-31854
LASER DOPPLER VELOCIMETERS
Laser Doppler anemometry and its application to flow measurements --- numerical flow computation aided by anemometry N81-31995
LASER FUSION
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350
LASER GYROSCOPES
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528
LASER HEATING
Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high tempeature excursions
[UCRL-53074] N81-31542
Thermal shocking an elastic half-space with a laser pulse N81-31562
Laser heating of aluminum exploding wire plasmas N81-32022
LASER INTERFEROMETRY
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear
[LA-8828-MS] N81-32037
LASER OUTPUTS
Change in reflectivity of metals under intense laser radiation, revision
[AD-A102005] N81-31342
Electron beam pumped tunable excimer lasers N81-31533
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535
Bandwidth and frequency enhancement of free electron laser in a mildly relativistic electron beam
[AD-A102164] N81-31538
LASER PLASMA INTERACTIONS
Measurements of the CO laser characteristics by medium modulation N81-31534
Nanosecond CO2 laser interaction with a dense helium Z-pinch plasma N81-32024
LASER PUMPING
Fluorescent probes in the solid state and their application to inorganic ion determinations N81-31305
Electron beam pumped tunable excimer lasers N81-31533
Development of X-ray laser media: Measurement of gain and development of cavity resonators for wavelengths near 130 Angstroms
[AD-A102335] N81-31539
LASER STABILITY
Bandwidth and frequency enhancement of free electron laser in a mildly relativistic electron beam
[AD-A102164] N81-31538
Unstable resonators
[AD-A102071] N81-31540
LASERS
Color center lasers for infrared spectroscopy N81-31536
Lasers and protection of the eyes N81-31854
Wavefront errors produced by multilayer thinfilm optical coatings N81-31983
LASING
Measurements of the CO laser characteristics by medium modulation N81-31534
LATERAL CONTROL
A study of the control principles of remotely controlled LV air defense missiles
[FOA-C-30180-E3] N81-31275
LATTICE PARAMETERS
Thermodynamic and magnetic properties of Hubbard lattices N81-32049
Long-range interactions in lattice field theory
[SLAC-240] N81-32069
LAUNCH VEHICLE CONFIGURATIONS
Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118
LAUNCH WINDOWS
Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239
LAUNCHING SITES
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277
LAVA
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
LAW (JURISPRUDENCE)
A review of The Department of Transportation regulations for transportation of radioactive materials, revised 1980 N81-31161
LEACHING
Selective extraction of metals from Pacific Sea nodules with dissolved sulfur dioxide
[PB81-197139] N81-31358
LEAD (METAL)
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047
LEAD ACID BATTERIES
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells
[ANL/OEPM-80-8] N81-31654
LEAD ISOTOPES
Eleven-year solar cycle influence on atmospheric exchanges in the Antarctica --- lead isotopes in aerosols N81-31766
LEADING EDGE SLATS
A calculation method for the viscous flow around multi-component airfoils
[NLR-TR-79097-U] N81-31523
Computation aspects and results of low-speed viscous flow about multicomponent airfoils
[NLR-MP-80034-U] N81-31526
LENS DESIGN
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849
Conventional optical correction of ametropias in aeronautics N81-31850
The indications of the use of contact lenses in aeronautics N81-31851
LENSES
Eye protection and tinted lenses N81-31852
LIFE (DURABILITY)
An introduction to NASA's turbine engine hot section technology (HOST) project N81-31206
The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry
[PB81-200073] N81-31408
LIFE CYCLE COSTS
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668
LIFE SCIENCES
Space life sciences --- definition - experiment proposals N81-31244
LIFE SUPPORT SYSTEMS
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250
LIFT
Evaluation of Ting's method for the calculation of the lift distribution on a wing in propulsive jets
[NLR-TR-80078-U] N81-31157
LIFT AUGMENTATION
High lift technology N81-31147
LIGANDS
Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359
LIGHT EMITTING DIODES
Display panel built using optical fibers and light emitting diodes
[FOA-C-30172-E1] N81-31992
LIGHT SCATTERING
High power submillimeter and infrared radiation from intense relativistic electron beams
[AD-A102487] N81-31541
LIGHTNING
A study of stratospheric discharges
[AD-A102284] N81-31726
Design of a spaceborne lightning sensor N81-31987
LIGHTNING SUPPRESSION
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277
LIGNITE
Lignite combustion test project summary report
[DOE/FC-02030/T1] N81-31323
LIMONITE
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
LINE SPECTRA
Limits of studying high-spin states by discrete-line Gamma-ray spectroscopy
[CONF-8006160-1] N81-31321
A spectrum of carbon dioxide from 800 to 5500 cm-1
[NASA-CR-164720] N81-31717
Effects of the solar magnetic field on the semiannual intensity of the green coronal line N81-31758

A spectrophotometric study of H 2 regions in chemically young galaxies N81-32093
Spectrophotometry of galactic supernova remnants N81-32094

LINEAR ACCELERATORS
High-current, short-pulse, RF-synchronized electron gun for the Stanford Linear Accelerator [SLAC-PUB-2705] N81-31980
Particle beam fusion [SAND-80-2500] N81-32038

LINEAR ARRAYS
An algebraic approach to data-adaptive array processing [AD-A101872] N81-31438
The collinear coaxial array antenna [RSRE-MEMO-3350] N81-31444
Advanced nSb monolithic Charge Coupled Infrared Imaging Devices (CCIRID) [NASA-CR-165766] N81-31990
Thermal infrared array, phase 1. Volume 1: Technical [NASA-CR-166705] N81-31991

LINEAR ENERGY TRANSFER (LET)
Health effects of low-level radiation [CONF-810606-47] N81-31824

LINEAR EQUATIONS
Aeroelastic analysis of a troposkien-type wind turbine blade [NASA-CR-165764] N81-31629

LINEAR POLARIZATION
The four-mode linearly-polarized ring laser gyro N81-31527

LINEAR PREDICTION
A regression analysis model with some transformations of the variables involved --- application to impact prediction [FOA-C-20332-D8] N81-31917

LINEAR SYSTEMS
Large deviation probabilities for certain dependent processes [AD-A102166] N81-31942

LINEARITY
On eliminating inferior regression models [AD-A101924] N81-31933

LINEARIZATION
Generalized dynamic stability for linearized yawing motion --- The stability of spinning projectiles [RMCS-80002] N81-31225

LINES (GEOMETRY)
A technique for line extraction from LANDSAT multi-spectral scanner satellite data with some applications of the technique [RAE-TR-81010] N81-31613

LININGS
Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204

LIQUEFIED NATURAL GAS
Flame propagation in gaseous fuel mixtures in semiconfined geometries [UCID-19000] N81-31324

LIQUID CRYSTALS
Critical dynamics of liquid crystal above the isotropic-nematic phase transition N81-32043

LIQUID HELIUM
Transverse acoustic impedance of normal liquid He-3 N81-32060

LIQUID SLOSHING
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565

LIQUID-VAPOR INTERFACES
Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Kinetics of phase separation in fluid mixtures --- influence of weightlessness N81-31248
Gas bubble formation in electrolytes under reduced gravity N81-31249
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250

LIQUIDS
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases [DOE/ET-14809/6] N81-31322

LITHIUM CHLORIDES
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables [AD-A102083] N81-31639

LITHIUM COMPOUNDS
Self discharge of cells with negative electrodes in lithium or lithium alloys [BMFT-FB-T-80-031] N81-31671

LITHOSPHERE
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706
On the compensation of geoid anomalies due to subducting slabs [NASA-TM-82157] N81-31721

LOAD DISTRIBUTION (FORCES)
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1952 to 31 December 1980 [AD-A102495] N81-31187

LOAD TESTS
NLR test results as a database to be used in a check of crack propagation prediction models: a Garteur Activity [NLR-TR-79121-U] N81-31589

LOADS (FORCES)
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies [NMI-R-71] N81-31522
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
Development of an orthotropic hole element [NASA-CR-165759] N81-31580

LOCKS (FASTENERS)
Safety locking device between sealed vessels --- for handling radioactive materials [BLL-RISLEY-4270-(9091.9F)] N81-31545
Mariners Weather Log, volume 25, no. 1 [PB81-195414] N81-31796

LOGIC CIRCUITS
Adaptive control system for line-commutated inverters [NASA-CASE-MFS-25209-1] N81-31480
Adaptive reference voltage generator for firing angle control of line-commutated inverters [NASA-CASE-MFS-25215-1] N81-31481

LOGIC DESIGN
Active beacon collision avoidance logic evaluation. Volume 1: Mode C equipped (ATCRBS) threat phase [AD-A102163] N81-31181

LONG TERM EFFECTS
A numerical model study of long-term planetary wave predictability N81-31710

LONG WAVE RADIATION
Requirements for improved infrared prediction capability: LWIR [AD-A102523] N81-32013

LOW GRAVITY MANUFACTURING
Convection in a floating zone without rotation --- on Earth and under reduced gravity N81-31263
Flow phenomena in a floating zone and feasibility of their investigation by means of the Space optics Laboratory --- in view of low gravity manufacturing N81-32000
Special problems encountered in the optical measurement of Marangoni-convection flow fields --- crystal melts N81-32001
Orientation experiment on the convection in metal melts --- under reduced gravity N81-32002
Cell convection of reduced gravity --- in crystal melts N81-32003

LOW TEMPERATURE
Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058

LOWER ATMOSPHERE
The magnetosphere, interface between the Sun and the lower atmosphere N81-31763

LOWER IONOSPHERE
Interpreting electron temperature changes in the lower ionosphere N81-31705

LUBRICATING OILS
Air uptake and air release behavior of lubricating oils and hydraulic fluids [DGMK-31] N81-31376

LUBRICATION SYSTEMS
Ball bearing mechanics [NASA-TM-81691] N81-31550

LUMINOSITY
Solar luminosity variation on directly observable time scales: observational evidence and basic mechanisms N81-31769
Structural variability of the Sun --- radius and luminosity N81-31770
Working group 3: Space measurements --- solar constant, experiments N81-31780

LUNAR CORE
Thermal conduction in a composite circular cylinder: A new technique for thermal conductivity measurements of lunar core samples [NASA-TM-82331] N81-31500

LUNGS
Comparison between the heat loss and heat gain through the lungs and body surface during hypothermia and its treatment [DRIC-T-6307] N81-31825

LYMAN ALPHA RADIATION
Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations [LA-UR-81-1247] N81-32110

LYMAN SPECTRA
Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations [LA-UR-81-1247] N81-32110

M

MACHINE TOOLS
Ultraprecision machining of optics at Los Alamos [LA-UR-81-1962] N81-32018

MACHINING
Progress in the battle with the burr [BDX-613-2306] N81-31552

MAGNESIUM SULFATES
Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin [PB81-197626] N81-31737

MAGNET COILS
Modular coils: A promising toroidal-reactor-coil system [PPPL-1796] N81-32034

MAGNETIC CONTROL
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307

MAGNETIC DISKS
Statistics of noise in photodetection: Applications in magneto-optical recording N81-31477

MAGNETIC FIELD CONFIGURATIONS
Particle-confinement criteria for axisymmetric field-reversed magnetic configurations [CONF-810450-1] N81-31977

MAGNETIC FIELDS
Electric and magnetic field measurements [PB81-218182] N81-31499
Experimental studies of autoacceleration concepts [AD-A101913] N81-31976
Field reversal by rotating waves [IPPJ-526] N81-32028

MAGNETIC POLES
Pole position for 1980 based on Doppler observations of the GEOS-3 Satellite [AD-A102548] N81-31727

MAGNETIC PROPERTIES
Thermodynamic and magnetic properties of Hubbard lattices N81-32049

MAGNETIC RECORDING
Continuous recording of the ECG according to the Holter method N81-31834

MAGNETIC STORMS
Development and design of three monitoring instruments for spacecraft charging [NASA-TP-1800] N81-31282
The electrical conductivity of the Earth's upper mantle as estimated from satellite measured magnetic field variations N81-31708
The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin --- pressure variations, magnetic storms N81-31760
Study of geomagnetic storms, solar flares, and centers of activity in 1977 [AD-A102301] N81-32109

MAGNETIC SWITCHING
The use of inductive position switches in personnel safety systems [FOA-C-30166-E5] N81-31170

MAGNETO-OPTICS
Statistics of noise in photodetection: Applications in magneto-optical recording N81-31477

MAGNETOHYDRODYNAMIC GENERATORS
Development and heat transfer analysis of direct coal fired MHD combustors
[DOE/ET-10815/T4] N81-31518
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results
[NASA-CR-165235] N81-31632
High B-field, large area ratio MHD duct experiments
[NASA-TM-82673] N81-32026
MAGNETOHYDRODYNAMICS
High B-field, large area ratio MHD duct experiments
[NASA-TM-82673] N81-32026
MAGNETOSPHERE
The magnetosphere, interface between the Sun and the lower atmosphere N81-31763
Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963
MAGNETOSTATIC FIELDS
Influence of transverse magnetic fields --- and rotation on Marangoni-convection in crystal melts N81-32004
MAGNETOSTATICS
Analysis and computer studies for magnetostatic surface wave transducers
[AD-A102207] N81-31954
MAGNETS
The 4th International Workshop on Rare-Cobalt Permanent Magnets and their Application
[PB81-196024] N81-31955
MAIN SEQUENCE STARS
Effects of magnetic fields on main sequence stars N81-32098
MAINTENANCE
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
Performance deterioration: An airline perspective N81-31202
Who needs engine monitoring? N81-31209
F100 engine diagnostic system status to date N81-31210
Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641
Evaluation of maintenance for fugitive VOC emission control
[PB81-206005] N81-31702
MAINTENANCE TRAINING
Actual versus simulated equipment for aircraft maintenance training: Cost implications of the incremental versus the unique device
[AD-A102388] N81-31104
MALES
The effects of gender and instructions on calibration
[AD-A102255] N81-31844
MAN ENVIRONMENT INTERACTIONS
Changing global biogeochemistry --- man-induced changes
[CM-52] N81-31689
Role of solar and non-solar sources in changing global climate in the past several hundred years N81-31759
The changing atmosphere: Its role in climate --- biological aspects N81-31776
MAN MACHINE SYSTEMS
The effects of various fidelity factors on simulated helicopter hover
[AD-A102028] N81-31232
Pilot interaction with automated airborne decision making systems
[NASA-CR-164729] N81-31847
Man and machine. An ergonometric perspective on various abilities, objectives and work patterns in the development of the system
[FOA-C-56020-H9] N81-31857
MANAGEMENT INFORMATION SYSTEMS
Evaluation of Texas Air Control Board management and operations systems requirements. Part 1: Identification of TACB, phase 1
[PB81-180945] N81-32078
Evaluation of Texas Air Control Board management and operations systems requirements. Part 2: Appendices to the part 1 report, phase 2
[PB81-180952] N81-32079
MANAGEMENT METHODS
The role of an electromagnetic environment model in spectrum management
[PB81-194672] N81-31448
MANAGEMENT PLANNING
Essentials of ground-water hydrology pertinent to water-resources planning
[BULL-16-REV] N81-31606
Candidate R&D thrusts for the software technology initiative
[AD-A102180] N81-31884
Facility management of computer-aided Design, Drafting/Manufacturing systems (CADD/M)
[UCRL-84959] N81-31895
Wisconsin manual to coordinate elderly and handicapped transportation services in rural and small urban counties
[PB81-197865] N81-32091
MANGANESE
Structural chemistry of the marine manganate minerals N81-31714
MANUFACTURING
Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299
MANY BODY PROBLEM
De HASS-Van Alphen measurements of one-electron and many-body effects in transition metals and intermetallic compounds
[CONF-800864-2] N81-31345
MAPPING
Theory for coloring bivariate statistical maps
[DOE/EV-10428/9] N81-31610
Generalization within automated cartographic systems
[RS-07-UT(3)] N81-31612
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
Ocean services for the nation. National ocean goals and objectives for the 1980's
[PB81-200602] N81-31808
Image understanding research
[AD-A102471] N81-31893
LAMMR world data base documentation support and demonstrations
[NASA-CR-166706] N81-32073
MAPS
Resource assessment of low- and moderate-temperature geothermal waters in Calistoga, Napa County, California. Report of the second year, 1979 to 1980 of the US Department of Energy - California State-Coupled Program for reservoir assessment and confirmation
[DOE/ET-27035/T1] N81-31609
MARINE BIOLOGY
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809
MARINE METEOROLOGY
ADS report number 4 --- oceanographic and meteorological conditions in the North Pacific
[AD-A102111] N81-31592
Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784
MARKET RESEARCH
SNIAS and the world market for application satellites --- television and communication satellites
[SNIAS-802-422-106] N81-31270
Highlights of NASA/DOE photovoltaics market assessment visit to Colombia
[NASA-TM-84011] N81-32081
MARKETING
Proceedings of the Symposium: Perspectives on Scientific and Technical Information
[ORNL-5749] N81-32076
Transfer of information from researcher to consumer: Choosing the appropriate media
[SERI/TP-513-1193] N81-32077
MARKOV PROCESSES
On an estimation scheme for Gauss Markov random field models --- image processing
[AD-A102057] N81-31938
On coupling of diffusion processes
[CTH-MATH-1981-1] N81-31950
Optimal point process estimators for Gaussian optical field intensities N81-31989
MARYLAND
Water resources data for Maryland and Delaware, water year 1980
[PB81-195885] N81-31616
MASS TRANSFER
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506
MATERIAL ABSORPTION
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250
MATERIALS HANDLING
Alternate fuels manufactured from high temperature solar thermal systems
[DOE/ET-21067/2] N81-31397
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
MATERIALS RECOVERY
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354
Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355
MATERIALS SCIENCE
Spacelab utilization: Materials research and processing technology in space --- conferences
[DGLR-80-02] N81-31241
Projects and plans of the German program on materials research and processing technology in space N81-31243
Multiple purpose facilities for materials science experiments in space N81-31251
MATHEMATICAL MODELS
Aerodynamic mathematical modeling - basic concepts N81-31106
Surrogate-equation technique for simulation of steady inviscid flow
[NASA-TP-1866] N81-31129
Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221
A model-following technique for insensitive aircraft control systems N81-31223
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method
[UCRL-85226] N81-31517
Analytical models for simultaneous heat and moisture transport in soils
[RHO-LD-49] N81-31519
A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547
Resonators with small apertures N81-31572
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
Improved version of the split routine for CLASSY
[E81-10210] N81-31600
A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716
On the compensation of geoid anomalies due to subducting slabs
[NASA-TM-82157] N81-31721
Long term variations of the solar constant --- solar models N81-31767
The solar neutrino problem --- solar models N81-31768
A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775
On eliminating inferior regression models
[AD-A101924] N81-31933

The development and application of a disaggregate Poisson model for trip generation
[IWIS-A-80-VK-01-01] N81-32090

MATHEMATICAL TABLES

Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 3: The measurement model
[DOE/TIC-1022361] N81-31648

Table of the modified Bessel functions of orders zero and one together with the function phi(z) = (21sub1)(z)/(zlsub0)(z) and its reciprocal for complex argument
[AD-A102444] N81-31912

Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945

MATRICES (MATHEMATICS)

Research on numerical algorithms for large space structures
[NASA-CR-164721] N81-31911

Second-order Particle-In-Cell (PIC) computational method in the one-dimensional variable Eulerian mesh system
[LA-UR-81-318] N81-31915

MATRIX MATERIALS

Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295

Hybridized polymer matrix composites
[NASA-CR-165339] N81-31361

MAXIMUM LIKELIHOOD ESTIMATES

Estimation in latent trait models
[AD-A102216] N81-31937

MEAN SQUARE VALUES

Optimal point process estimators for Gaussian optical field intensities N81-31989

MEASURING INSTRUMENTS

Exhaust sensor for heating systems --- combustion optimization and pollution control
[BMFT-FB-T-80-054] N81-31326

STI: An objective measure for the performance of voice communication systems N81-31465

MECHANICAL IMPEDANCE

On the application of a TV-multipoint x-y tracker to the measurement of the transmissibility of human vibration --- a mechanical impedance model N81-31846

MECHANICAL PROPERTIES

Fillers for improved graphite fiber retention by polymer matrix composites
[NASA-CR-165437] N81-31288

Effect of production conditions on physical and mechanical properties of aluminum with low iron concentrates N81-31330

Microstructure and mechanical properties of bulk yttria-partially-stabilized zirconia
[NASA-CR-165402] N81-31340

The effects of trace elements in nickel containing steels and alloys
[DRIC-T-6345] N81-31353

Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366

High temperature mechanical properties of polyphase ceramics based on silicon nitride
[AD-A102121] N81-31372

Theoretical and experimental study of the behavior of reinforced plastic plates. Part 1: General theory
[CRIF-PL-14-PT-1] N81-31587

MELTING

Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775

MELTS (CRYSTAL GROWTH)

Concentration profiles in front of solidification fronts --- crystal growth N81-31254

Porosity of welds --- under reduced gravity N81-31255

Solvent zone crystallization of CdTe in a mirror heating facility --- orientation experiments for space manufacturing N81-31256

Melting-pot free production of 3-5 semiconductor crystals in a mirror oven --- by traveling solvent method N81-31257

Construction and test of a mono-ellipsoid mirror heating facility --- for crystal growth experiments during space flight N81-31258

Results of experiments on directional solidification of the InSb-NiSb eutectic in the gradient heating facility of CNES, Toulouse. Draft of a characterizing program for eutectic probes N81-31259

Growth of beryllium monocrystals for neutron monochromators N81-31260

Marangoni convection in a rotating melting zone N81-31264

Reaction kinetics in molten glasses N81-31265

Flow phenomena in a floating zone and feasibility of their investigation by means of the Space optics Laboratory --- in view of low gravity manufacturing N81-32000

Special problems encountered in the optical measurement of Marangoni-convection flow fields --- crystal melts N81-32001

Orientation experiment on the convection in metal melts --- under reduced gravity N81-32002

Cell convection of reduced gravity --- in crystal melts N81-32003

Influence of transverse magnetic fields --- and rotation on Marangoni-convection in crystal melts N81-32004

Growth of silicon crystals --- under reduced gravity N81-32008

MERCURY CADMIUM TELLURIDES

Growth of HgCdTe by modified molecular beam epitaxy
[AD-A102272] N81-32064

MESON RESONANCES

Observation of new resonance structure in the natural spin parity strange meson system
[SLAC-PUB-2729] N81-31967

MESOSPHERE

Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239

MESSAGE PROCESSING

NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423

Dissemination of weather information in the air traffic control system
[AD-A102027] N81-31787

METABOLISM

Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810

METAL COATINGS

Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350

Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings
[DOE/ET-10245/1-VOL-2] N81-31351

METAL CRYSTALS

Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192

Plastic dislocation motion via nonequilibrium molecular and continuum dynamics
[UCRL-84146] N81-32068

METAL FATIGUE

Prevention of corrosion and fatigue failure of helicopter gas turbine compressors
[NLR-MP-80024-U] N81-31222

METAL FLUORIDES

Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318

METAL JOINTS

Digitally-controlled adaptive welding system
[PB81-183907] N81-31556

METAL MATRIX COMPOSITES

Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298

Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299

METAL PARTICLES

Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355

METAL SHEETS

Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583

METAL SURFACES

Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058

METAL WORKING

Superplastic forming and diffusion bonding of CORONA 5
[AD-A102206] N81-31344

METALLIC GLASSES

Electron spin resonance in amorphous alloys N81-32057

METALLIC HYDROGEN

Metallic hydrogen: A two-body approach to band theory and a quantum mechanical test of Diophantine methods N81-32055

METALLOGRAPHY

Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high tempeature excursions
[UCRL-53074] N81-31542

METALS

Conservation of Strategic Aerospace Materials (COSAM) N81-31208

Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318

Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346

Selective extraction of metals from Pacific Sea nodules with dissolved sulfur dioxide
[PB81-197139] N81-31356

Operation of the Metals and Ceramics Information Center
[AD-A102212] N81-31371

METEOR TRAILS

Investigation of turbulence according to fluctuating radio reflections --- meteor trails, atmospheric turbulence
[PNR-90063] N81-31793

METEORITES

Inert gases in fifteen iron meteorites N81-32103

METEORITIC COMPOSITION

Inert gases in fifteen iron meteorites N81-32103

METEOROLOGICAL CHARTS

ADS report number 4 --- oceanographic and meteorological conditions in the North Pacific
[AD-A102111] N81-31592

METEOROLOGICAL PARAMETERS

Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599

Meteorological data. Volume 3, number 4: Comparative investigation between the climate prevailing during the full 24-hour day and that during the nine-hour working day (7 a.m. - 4 p.m.) in Berlin, series A monographs
[ISSN-0342-4324] N81-31742

Atmospheric environment for space shuttle (STS-1) launch
[NASA-TM-82436] N81-31743

Solar activity and variations of meteorological parameters --- climate N81-31765

Further analysis of tropical cyclone characteristics from rawinsonde compositing techniques
[AD-A102053] N81-31785

Improved weather services for helicopter operations in the Gulf of Mexico
[AD-A102209] N81-31786

Maui optical site, Mount Halekualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F
[AD-A102394] N81-31788

Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789

Carbon dioxide, condensation nuclei and wind climatology of the Barrow GMCC Observatory (1973-1979)
[PB81-198715] N81-31800

METEOROLOGY

Modeling and analysis of air-quality data
[DOE/EV-10428/8] N81-31686

METHANATION
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
METHANE
Methane spectral analysis
[AD-A102300] N81-31316
Methane Transportation Research, Development, and Demonstration Act of 1980
[PUBL-96-126] N81-31381
Alcohol fuels
[GPO-70-454] N81-31384
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399
Direct method determination of the gas content of coal: Procedures and results
[PB81-196735] N81-31401
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
METHOXY SYSTEMS
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
MEXICO
Power spectra of the climatological variations in Mexico City --- solar terrestrial interactions N81-31755
MICROCHANNEL PLATES
Infinite gamma device program
[NASA-CR-166707] N81-31476
MICROCOMPUTERS
Bulk-memory processor for data acquisition
[LA-UR-81-1568] N81-31869
MICROELECTRONICS
Advanced electronic technology
[AD-A102144] N81-31484
MICROPHONES
An automated multiple choice intelligibility testing system N81-31468
MICROPROCESSORS
Prototype microprocessor controller --- for STDN antennas
[NASA-CR-166703] N81-31861
Electrical characterization of microprocessor memories
[AD-A102305] N81-31862
MICROSTRUCTURE
Capillary induced microstructural instabilities in directionally solidified eutectic composites N81-31329
The separate roles of forest dislocations and subgrains in the isotropic hardening of type 304 stainless steel N81-31334
Microstructure and mechanical properties of bulk yttria-partially-stabilized zirconia
[NASA-CR-165402] N81-31340
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels. Part 1: Literature assessment
[SAND-80-0732-PT-1] N81-31349
A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716
MICROWAVE ATTENUATION
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445
MICROWAVE EQUIPMENT
Unequal split microwave power divider
[NASA-CASE-LAR-12889-1] N81-31483
MICROWAVE FREQUENCIES
Report on the Military Microwaves' 1980 Conference
[RSRE-MEMO-3348] N81-31443
MICROWAVE LANDING SYSTEMS
Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180
Terminal area automatic navigation, guidance, and control 1: Automatic rollout, turnoff, and taxis
[NASA-CR-3451] N81-31224
MLS antenna locations for the deHaviland DASH 7 aircraft
[NASA-TM-83195] N81-31418
MICROWAVE RADIOMETERS
The outlook for precipitation measurements from space
[NASA-TM-82172] N81-31746
MICROWAVE TRANSMISSION
Study of antenna radome problems
[AD-A102205] N81-31432
Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633
Analysis of interference caused by the Solar Power Satellite to satellite earth terminals
[PB81-194268] N81-31676
Analysis of interference from the Solar Power Satellite to general electronics systems
[PB81-194250] N81-31677
Impact of Satellite Power Systems on the ionosphere
[DOE/CH-10003/1] N81-31678
MICROWAVES
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803
MIDCOURSE GUIDANCE
Effects of missile and target acceleration parameters on time-to-go estimation
[AD-A102091] N81-31273
MIGRATION
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052
MILITARY AIRCRAFT
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820
MILITARY HELICOPTERS
Structural response methods and evaluation results for helicopter landing decks on 210- and 270-foot USCCG cutters
[AD-A102420] N81-31233
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459
MILITARY OPERATIONS
Human performance in continuous operations: Description of a simulation model and user's manual for evaluation of performance degradation
[AD-A101950] N81-31856
MILITARY TECHNOLOGY
Report on the Military Microwaves' 1980 Conference
[RSRE-MEMO-3348] N81-31443
MINERAL DEPOSITS
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
Structural chemistry of the marine manganate minerals N81-31714
MINERAL EXPLORATION
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602
MINERALS
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391
Interchange of pollutants between groundwater and and mineral strata as applied to waste chemical dumps and in situ coal gasification sites
[PB81-198335] N81-31697
MINES (EXCAVATIONS)
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602
Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603
Demonstration of subsidence monitoring system
[DOE/ET-10029/T1] N81-31731
MINICOMPUTERS
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
MINING
Direct method determination of the gas content of coal: Procedures and results
[PB81-196735] N81-31401
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602
MIRROR FUSION
Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
MIRRORS
Construction and test of a mono-ellipsoid mirror heating facility --- for crystal growth experiments during space flight N81-31258
Wavefront errors produced by multilayer thinfilm optical coatings N81-31983
Structural design of a large deformable primary mirror for a space telescope N81-31984
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021
MIS (SEMICONDUCTORS)
Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
MISSILE CONFIGURATIONS
Application to missile dynamics N81-31123
MISSILE CONTROL
Dynamic Stability Parameters --- conferences
[AGARD-LS-114] N81-31105
Impact of high-alpha aerodynamics on dynamic stability parameters of aircraft and missiles N81-31107
Rotary and Magnus balances N81-31111
Analytical determination of dynamic stability parameters N81-31117
Effects of missile and target acceleration parameters on time-to-go estimation
[AD-A102091] N81-31273
A study of the control principles of remotely controlled LV air defense missiles
[FOA-C-30180-E3] N81-31275
MISSILE TRAJECTORIES
Effects of missile and target acceleration parameters on time-to-go estimation
[AD-A102091] N81-31273
MISSOURI
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614
MIXING
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
MODULES
An approach to reliable integration testing
[AD-A102477] N81-31886
Cellular architectures: From automata to hardware --- image processing
[AD-A102059] N81-31907
MOLECULAR BEAM EPITAXY
Growth of HgCdTe by modified molecular beam epitaxy
[AD-A102272] N81-32064
MOLECULAR BIOLOGY
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
MOLECULAR CLOUDS
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099
MOLECULAR ENERGY LEVELS
Methane spectral analysis
[AD-A102300] N81-31316
MOLECULAR EXCITATION
Measurements of the CO laser characteristics by medium modulation N81-31534

MOLECULAR INTERACTIONS
Physics with fast molecular-ion beams
[CONF-801111-44] N81-31965
Negative ion/molecule reactions in a negative corona discharge
[UTIAS-TN-230] N81-32027
MOLECULAR IONS
Using an electrostatic accelerator to determine the stereochemical structures of molecular ions
[CONF-801111-43] N81-31964
MOLECULAR STRUCTURE
Matrix isolation spectra and structures of unstable molecules N81-31961
Using an electrostatic accelerator to determine the stereochemical structures of molecular ions
[CONF-801111-43] N81-31964
MOLTEN SALT ELECTROLYTES
Electrode polarization studies in hot corrosion systems --- molten salt electrolytes N81-31337
MOLYBDENUM
Thermal diffusivities of molybdenum/alumina cermets
[GEPP-TIS-472] N81-31375
MOMENTUM TRANSFER
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506
MONITORS
Tester line voltage monitor
[BDX-613-2449] N81-31531
Demonstration of subsidence monitoring system
[DOE/ET-10029/T1] N81-31731
The application of optical fibers for monitoring devices for the detection of plastic strain and cracking
[NMI-R-72] N81-32020
MONOMERS
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-1] N81-31364
MONTE CARLO METHOD
Monte Carlo calculation of the Born-Oppenheimer potential between two helium atoms N81-31960
MORPHOLOGY
Factors affecting graphite morphology, matrix structure and tensile properties of compacted graphite cast irons N81-31331
MOVING TARGET INDICATORS
Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428
MULTIPATH TRANSMISSION
Space diversity experiments on a 20 kilometer long 15 GHz link --- reduction of mutipath fading
[REPT-455-TBR-70] N81-31442
MULTIPLEXING
High speed multiplex bus protocol study
[AD-A102113] N81-31191
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474
MULTIPROCESSING (COMPUTERS)
Advanced multiple processor configuration study
[AD-A101919] N81-31868
MULTIPROGRAMMING
Synchronization: A formal approach N81-31871
MULTISPECTRAL BAND SCANNERS
A technique for line extraction from LANDSAT muiti-spectral scanner satellite data with some applications of the technique
[RAE-TR-81010] N81-31613
MULTISPECTRAL PHOTOGRAPHY
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614
MULTIVARIATE STATISTICAL ANALYSIS
Recognition test for an open set of talkers represented by their acoustic parameters
[FUB-2-1981] N81-31446
An asymptotic expansion of the distribution of the weighted-difference classification criterion for discrimination of two and three multivariate normal populations N81-31926
Order restricted statistical tests on multinomial and Poisson parameters: The starshaped restriction
[AD-A102562] N81-31936
A parametric analysis of structured and unstructured Q-sort data
[AD-A102169] N81-31944
Tests for standardized generalized variances of multivariate normal populations of possibly different dimensions
[AD-A102021] N81-31948
MUONS
Study of rare processes induced by 209-Gev muons
[LBL-12789] N81-31966
MYOCARDIAL INFARCTION
Echocardiography in aviation medicine N81-31831
Prevention of cardiovascular diseases N81-31836
Cardiovascular problems during the pilots career N81-31837

N

N-TYPE SEMICONDUCTORS
Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065
NACELLES
Performance retention of the RB211 powerplant in service N81-31201
NAPHTHENES
Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359
NASA PROGRAMS
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423
NASA Authorization, 1982, volume 5
[GPO-79-550] N81-32082
NASA Tech Briefs Index, 1980, vol. 5 nos. 1-4 --- bibliography
[NASA-SP-5021(22)] N81-32085
Space Benefits: The secondary application of aerospace technology in other sectors of the economy
[NASA-CR-164733] N81-32086
NATIONAL AIRSPACE UTILIZATION SYSTEM
NAS automation equipment operating cost estimates, FY 1978 - 1979
[AD-A102023] N81-31182
Airport and airway system development act of 1981
[GPO-75-804] N81-31231
NATURAL LANGUAGE (COMPUTERS)
Evaluation of natural language processors N81-31858
Word Expert Parsing: A theory of distributed word-based natural language understanding N81-31876
Integrating local information to understand dialog N81-31879
NAVIGATORS
Hearing impaired aviators in the U.S. Army N81-31471
NEBULAE
A spectrophotometric study of H 2 regions in chemically young galaxies N81-32093
NEODYMIUM LASERS
Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high tempeature excursions
[UCRL-53074] N81-31542
Joint European Torus (JET) design study 8.3: Quasi-continuous laser scattering. Part 2: Extension to spatial scan
[IPF-81-3-PT-2] N81-31544
NEPHANALYSIS
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts
[PB81-198293] N81-31797
NETWORK ANALYSIS
Query processing in a distributed database N81-32072
NETWORK SYNTHESIS
Time-domain in analysis of lumped/distributed networks for Electromagnetic Compatibility (EMC) applications --- transmission lines
[AD-A102268] N81-31439
On the numerical analysis of the weight optimization of geodetic nets --- second order design
[SER-C-256] N81-31734
NEUTRAL BEAMS
Neutral-beam injectors for 1990 and 2005
[UCRL-53112] N81-31978
NEUTRAL SHEETS
Nonlinear equatorial spread F: The effect of neutral winds and background Pedersen conductivity
[AD-A102555] N81-31278
Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963
NEUTRON SCATTERING
Interpretation and normalization of experimental data for total, scattering, and reaction cross sections --- fast neutron data
[CONF-800979-20] N81-31970
Report of the review panel on neutron scattering
[IS-4761] N81-31971
NEUTRON SOURCES
Report of the review panel on neutron scattering
[IS-4761] N81-31971
NEUTRON SPECTROMETERS
Growth of beryllium monocrystals for neutron monochromators N81-31260
NEUTRON STARS
The origin of the Crab Nebula and the electron capture supernova in 8-10 M solar mass stars
[NASA-TM-82179] N81-32097
NICKEL
Hydrogen in metals N81-31335
NICKEL ALLOYS
The effects of trace elements in nickel containing steels and alloys
[DRIC-T-6345] N81-31353
NICKEL CADMIUM BATTERIES
Characterization of the physico-chemical properties of polymeric materials for aerospace flight --- nickel cadmium batteries
[NASA-CR-160070] N81-31362
The 50 AMP-hour nickel cadmium battery manual
[NASA-CR-168701] N81-31626
NICKEL STEELS
The effects of trace elements in nickel containing steels and alloys
[DRIC-T-6345] N81-31353
NITRATES
Reactions of free radicals with nitro-compounds and nitrates
[AD-A102286] N81-31314
Biological reduction of nitrate wastewater using fluidized-bed bioreactors
[CONF-810554-2] N81-31812
NITRIC OXIDE
Absorption spectroscopy of combustion gases using a tunable diode laser N81-31302
NITROGEN COMPOUNDS
Evolution of fuel nitrogen during the vacuum thermal devolatiization of coal
[DOE/ET-10744/T3] N81-31390
Metabolism of hydrazine
[AD-A101849] N81-31818
NITROGEN METABOLISM
Metabolism of hydrazine
[AD-A101849] N81-31818
NITROGEN OXIDES
Guideline for applying the the Airshed Model to urban areas
[PB81-200529] N81-31699
NITROGEN 15
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113
NOISE (SOUND)
The effect of noise on the vestibular system N81-31455
Hearing conservation N81-31472
NOISE MEASUREMENT
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602
Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848
NOISE METERS
Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848
NOISE POLLUTION
Minimum noise impact aircraft trajectories
[NASA-CR-164719] N81-31159
Presentation to the European Union against Aircraft Nuisances --- jet noise reduction, airports
[PNR-90064] N81-31959

NOISE REDUCTION
Minimum noise impact aircraft trajectories
[NASA-CR-164719] N81-31159
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459
An active noise reduction system for aircrew helmets N81-31470
Flying helmet attenuation, and the measurement, with particular reference to the Mk 4 helmet N81-31473
Sidetone-level considerations in aircraft communication systems N81-31475
Turbomachinery noise studies of the AiResearch QCGAT engine with inflow control
[NASA-TM-82694] N81-31957
Presentation to the European Union against Aircraft Nuisances --- jet noise reduction, airports
[PNR-90064] N81-31959
Achromatic coherent optical systems for information processing and holography N81-31986

NOISE SPECTRA
Proton-induced noise in digicons
[NASA-TP-1852] N81-31281

NONDESTRUCTIVE TESTS
Damage tolerance of a landing gear component after many takeoffs and landings --- nondestructive tests
[NLR-MP-79039-U] N81-31189
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530
Nondestructive evaluation of path-independent integrals in fracture mechanics N81-31570

NONEQUILIBRIUM THERMODYNAMICS
Space experiments on dissipative structures N81-32005
Plastic dislocation motion via nonequilibrium molecular and continuum dynamics
[UCRL-84146] N81-32068

NONLINEAR OPTICS
Infinite gamma device program
[NASA-CR-166707] N81-31476

NONLINEAR SYSTEMS
On solitary kinetic Alfven waves in a magnetized plasma N81-32025

NONLINEARITY
Hydrodynamic stability of thin films N81-31505

NONPARAMETRIC STATISTICS
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates
[AD-A102413] N81-31940

NORMAL DENSITY FUNCTIONS
Computation of the integral of the bivariate normal distribution over arbitrary polygons
[AD-A102466] N81-31928

NORMALITY
The first four moments of a distribution --- properties of estimations; testing for normality
[IWIS-TNO-A-79-ST-66-36] N81-31951

NORTH AMERICA
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805

NORTH ATLANTIC TREATY ORGANIZATION (NATO)
NATO regulations on the cardio-vascular system N81-31829

NOZZLE THRUST COEFFICIENTS
On the calculation of thrust coefficient
[PERME-MEMO-150] N81-31284

NUCLEAR EXPLOSIONS
Deterministic methods of seismic source identification
[AD-A102333] N81-31723
Evaluation of some geophysical events on 22 September 1979
[LA-8672] N81-31728
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820

NUCLEAR FUSION
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031
Status of the Tokamak program
[ORNL/TM-7778] N81-32039
Reports from the Departments of Electron and Plasma Physics: Index and Abstracts, 1980
[TRITA-EPP-80-13] N81-32042

NUCLEAR MAGNETIC RESONANCE
optical rotation rate sensors N81-31174
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175
Nuclear magnetic resonance of platinum catalysts: The discovery of the surface resonance N81-32045

NUCLEAR REACTIONS
Study of rare processes induced by 209-Gev muons
[LBL-12789] N81-31966
Observation of new resonance structure in the natural spin parity strange meson system
[SLAC-PUB-2729] N81-31967
Thresholds and Q values of nuclear reactions induced by neutrons, protons, deuterons, tritons He-3 ions, alpha particles, and photons, volume 24
[UCRL-50400-VOL-24] N81-31979

NUCLEAR RESEARCH
Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640

NUCLEAR RESEARCH AND TEST REACTORS
Report of the review panel on neutron scattering
[IS-4761] N81-31971

NUCLEONS
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487

NULL HYPOTHESIS
On multiple comparisons --- significance tests N81-31921

NUMERICAL ANALYSIS
Numerical experiments in homogeneous turbulence
[NASA-TM-81315] N81-31508
Theoretical and experimental investigation of coherent structure in the turbulent boundary layer
[AD-A102368] N81-31511
Global function approach in structural analysis: Basic approach, numerical results
[NASA-CR-165669] N81-31579

NUMERICAL CONTROL
Case studies in computer control --- process control
[RR-145] N81-31910

NUMERICAL FLOW VISUALIZATION
Evaluation of Ting's method for the calculation of the lift distribution on a wing in propulsive jets
[NLR-TR-80078-U] N81-31157
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method
[UCRL-85226] N81-31517
Boundary layers with strong interaction: From asymptotic theory to calculation method
[NLR-MP-80015-U] N81-31524
The calculation of incompressible boundary layers with strong viscous-inviscid interaction
[NLR-MP-80032-U] N81-31525

NUTRITIONAL REQUIREMENTS
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810

O

OCEAN BOTTOM
Pore-filling cements in turbidites: Southern California: Products of early diagenesis and dewatering of shale N81-31713
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803

OCEAN CURRENTS
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment
[PB81-198939] N81-31807

OCEAN DATA ACQUISITIONS SYSTEMS
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment
[PB81-198939] N81-31807
Ocean services for the nation. National ocean goals and objectives for the 1980's
[PB81-200602] N81-31808

OCEAN MODELS
An empirical model for tidal currents in Puget Sound, Strait of Juan de Fuca, and Southern Strait of Georgia
[PB81-197345] N81-31806

OCEAN SURFACE
ADS report number 4 --- oceanographic and meteorological conditions in the North Pacific
[AD-A102111] N81-31592
Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803

OCEAN THERMAL ENERGY CONVERSION
Ocean thermal energy conversion power system development-2, phase 2
[DOE/ET-21056/T3] N81-31651

OCEANOGRAPHIC PARAMETERS
Mariners weather log, volume 24, number 6, November-December 1980
[PB81-195372] N81-31795
Oceanic Lidar
[NASA-CP-2194] N81-31801
Ocean services for the nation. National ocean goals and objectives for the 1980's
[PB81-200602] N81-31808

OCEANS
A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679

OCULOMETERS
Dynamics of two-dimensional eye-head tracking
[AD-A102369] N81-31842

OGIVES
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154

OHMIC DISSIPATION
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030

ONBOARD DATA PROCESSING
The 30/20 GHz demonstration system SSUS-D/BSE
[NASA-CR-165454] N81-31419

ONBOARD EQUIPMENT
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820

OPERATING COSTS
NAS automation equipment operating cost estimates, FY 1978 - 1979
[AD-A102023] N81-31182

OPERATING SYSTEMS (COMPUTERS)
A small operating system for real-time runs on a Nord-10
[FOA-C-20336-E3] N81-31900

OPERATORS (MATHEMATICS)
Covariance operators and their applications in probability and information theory N81-31923

OPTICAL COMMUNICATION
Optical fiber communications cable connector
[AD-A102508] N81-32015

OPTICAL CORRECTION PROCEDURE
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849

OPTICAL COUPLING
Optical triggering of power thyristors
[BMFT-FB-T-80-083] N81-31493

OPTICAL DATA PROCESSING
Achromatic coherent optical systems for information processing and holography N81-31986

OPTICAL EQUIPMENT
Achromatic coherent optical systems for information processing and holography N81-31986
Ultraprecision machining of optics at Los Alamos
[LA-UR-81-1962] N81-32018
Space Telescope digicon technology
[NASA-CR-166704] N81-32096

OPTICAL GYROSCOPES
optical rotation rate sensors N81-31174
OPTICAL MEASUREMENT
Development of measurement methodology for, evaluating fugitive particulate emissions
[PB81-196594] N81-31690
Signal fluctuations in an underground laid optical cable --- optical measurement N81-32012
OPTICAL MEASURING INSTRUMENTS
Fiber optics for aircraft engine/inlet control
[NASA-TM-82654] N81-31190
Optics workshop: View of the applications of the Space Optics Laboratory, Aug. 1979 --- conferences, Aug. 1979
[BMFT-FB-W-79-44] N81-31993
The Space Optics Laboratory --- concept and realization N81-31996
Application of the Space Optics Laboratory in the specific case of Benard cell convection N81-31997
Modes of operation of the Space Optics Laboratory N81-31998
Flow phenomena in a floating zone and feasibility of their investigation by means of the Space optics Laboratory --- in view of low gravity manufacturing N81-32000
OPTICAL RADAR
Development of measurement methodology for, evaluating fugitive particulate emissions
[PB81-196594] N81-31690
Accommodations assessment: Spaceborne Doppler lidar wind measuring system
[NASA-TM-82435] N81-31744
Oceanic Lidar
[NASA-CP-2194] N81-31801
OPTICAL THICKNESS
Satellite measurements of tropospheric aerosols
[NASA-CR-3459] N81-31680
OPTICAL TRACKING
Dynamics of two-dimensional eye-head tracking
[AD-A102369] N81-31842
OPTICAL WAVEGUIDES
Mode theory for an equilateral triangular dielectric waveguide N81-31478
OPTIMAL CONTROL
Problems in optimal filtering and stochastic control
[AD-A102478] N81-31929
OPTIMIZATION
Toward optimization of the woven flywheel
[UCRL-15359] N81-31294
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
On the numerical analysis of the weight optimization of geodetic nets --- second order design
[SER-C-256] N81-31734
Evolutionary structure and search N81-31860
Some locally optimal subset selection rules
[AD-A101923] N81-31932
ORBIT DECAY
Orbital decay in a dynamic atmosphere
[UTIAS-244] N81-31266
Life and death of artificial satellites --- perturbations and orbit decay
[AERONOMICA-ACTA-A-228-1981] N81-31269
ORBIT PERTURBATION
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267
ORDER-DISORDER TRANSFORMATIONS
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
ORGANIC COMPOUNDS
Evaluation of maintenance for fugitive VOC emission control
[PB81-206005] N81-31702
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
ORGANIC WASTES (FUEL CONVERSION)
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
ORGANOMETALLIC COMPOUNDS
Photoegeneration of reactive organometallic species
[AD-A102069] N81-31286
Photochemistry of surface-confined organometallics: Photochemical release of a surface-confined cobalt carbonyl catalyst
[AD-A102112] N81-31317
ORION NEBULA
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099
ORTHOTROPIC PLATES
Development of an orthotropic hole element
[NASA-CR-165759] N81-31580
OSCILLATING FLOW
Effect of oscillating flow on combustion rate of coal particles N81-31300
OSCILLOSCOPES
Oscillator monitor
[EGG-1183-1802] N81-31532
OUTPUT
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems --- digital systems
[FUB-3-1981] N81-31920
OVENS
Solvent zone crystallization of CdTe in a mirror heating facility --- orientation experiments for space manufacturing N81-31256
Construction and test of a mono-ellipsoid mirror heating facility --- for crystal growth experiments during space flight N81-31258
OXIDATION
Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
Sulfur dioxide oxidation reactions in aqueous solutions
[PB81-196834] N81-31736
OXYGEN
Effect of oscillating flow on combustion rate of coal particles N81-31300
Oxygen diffusion in vanadium-based alloys N81-31338
Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058
OXYGEN SUPPLY EQUIPMENT
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results
[NASA-CR-165235] N81-31632
OZONE
Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
Ozone depletion calculations
[UCRL-85814] N81-31730
Requirements for improved infrared prediction capability: LWIR
[AD-A102523] N81-32013

P

P WAVES
Deterministic methods of seismic source identification
[AD-A102333] N81-31723
PACIFIC OCEAN
ADS report number 4 --- oceanographic and meteorological conditions in the North Pacific
[AD-A102111] N81-31592
Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment
[PB81-198939] N81-31807
PACKET SWITCHING
Packet communication in delta and related networks N81-31417
PALEONTOLOGY
A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774
PANEL METHOD (FLUID DYNAMICS)
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow
[NASA-CR-3466] N81-31127
PANELS
Blast-resistant capacities of cold-formed steel panels
[AD-A101915] N81-31343
Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583
PARABOLIC DIFFERENTIAL EQUATIONS
K-line iterative methods: A conjugate-gradient approach --- two-dimensional parabolic and elliptic difference equations
[LA-UR-81-1409] N81-31916
PARACHUTE DESCENT
Wind measurements by parachute
[FOA-C-20344-D2] N81-31748
PARALLEL PROCESSING (COMPUTERS)
Cellular architectures: From automata to hardware --- image processing
[AD-A102059] N81-31907
PARAMETER IDENTIFICATION
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
Estimation of dynamic stability parameters from drop model flight tests N81-31116
Analytical determination of dynamic stability parameters N81-31117
Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118
Control derivatives N81-31119
Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120
Some applications of aerodynamic formulations to problems in aircraft dynamics N81-31121
Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122
Application to missile dynamics N81-31123
PARSING ALGORITHMS
Word Expert Parsing: A theory of distributed word-based natural language understanding N81-31876
PARTICLE ACCELERATOR TARGETS
Particle beam fusion
[SAND-80-2500] N81-32038
PARTICLE ACCELERATORS
Physics with fast molecular-ion beams
[CONF-801111-44] N81-31965
PARTICLE BEAMS
Physics with fast molecular-ion beams
[CONF-801111-44] N81-31965
Advanced development of particle-beam-probe diagnostic systems
[DOE/ET-53004/20] N81-31981
PARTICLE COLLISIONS
Banana drift transport in tokamaks with ripple
[PPPL-1784] N81-32032
PARTICLE IN CELL TECHNIQUE
Second-order Particle-In-Cell (PIC) computational method in the one-dimensional variable Eulerian mesh system
[LA-UR-81-318] N81-31915
PARTICLE MASS
Fixed points: Fermion mass predictions
[FERMILAB-CONF-81/44-THY] N81-31962
PARTICLE MOTION
Field reversal by rotating waves
[IPPJ-526] N81-32023
PARTICLE PRODUCTION
Study of rare processes induced by 209-Gev muons
[LBL-12789] N81-31966
PARTICLE SIZE DISTRIBUTION
Measurements of the size distribution and solubility of Salty Dog pyrotechnic
[AD-A102547] N81-31389

Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7
[PB81-196628] N81-31692
PARTICLE THEORY
Hyperpions at the Z(0)
[DOE/ER-01545/306] N81-31968
Quark-antiquark potential and quantum chromodynamics
[FERMILAB-CONF-81/38-THY] N81-31969
PARTICLE TRAJECTORIES
Banana drift transport in tokamaks with ripple
[PPPL-1784] N81-32032
PARTICLES
Dielectrophoresis N81-31304
PARTICULATE SAMPLING
Filter media for collecting diesel particulate matter
[PB81-197774] N81-31695
PASSENGER AIRCRAFT
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane
[NASA-CR-165768] N81-31184
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236
PATTERN RECOGNITION
Improved version of the split routine for CLASSY
[E81-10210] N81-31600
Edge-based texture measures
[AD-A102060] N81-31908
The classification and mixture maximum likelihood approaches to cluster analysis
[AD-A102084] N81-31946
PATTERN REGISTRATION
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
PAVEMENTS
Asphaltic concrete overlays of rigid and flexible pavements
[PB81-197394] N81-31407
Summary and recommendations for the implementation of rigid pavement design, construction and rehabilitation techniques
[PB81-200578] N81-31409
Analysis and design of continuously reinforced concrete pavements N81-31564
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590
PAYLOADS
Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239
PDP 11 COMPUTER
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904
PDP 11/40 COMPUTER
The data processing system at FOA Institution 27. Software organization principles
[FOA-C-20361-D3] N81-32074
PENDULUMS
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733
PENETRATION
Modelling penetration by slender high kinetic energy projectiles
[MRL-R-811] N81-31546
PERFORMANCE TESTS
JT9D jet engine diagnostics program N81-31199
JT8D engine performance retention N81-31200
Performance retention of the RB211 powerplant in service N81-31201
Performance analysis of dedicated heat-pump water heaters in an office building
[SERI/TP-721-1198] N81-31404
Voice communication capability of selected inflight headgear devices N81-31467
An automated multiple choice intelligibility testing system N81-31468
Detection instrumentation for cable shield defects
[PB81-194540] N81-31496
Experimentally determined performance of some residential circuit breakers
[PB81-197048] N81-31498
Tester line voltage monitor
[BDX-613-2449] N81-31531
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells
[ANL/OEPM-80-8] N81-31654
Turbomachinery noise studies of the AiResearch QCGAT engine with inflow control
[NASA-TM-82694] N81-31957
PERIODIC VARIATIONS
Temperature variability and the 22 year solar cycle N81-31753
Rainfall patterns in South Africa, southeastern Australia and New Zealand N81-31754
Power spectra of the climatological variations in Mexico City --- solar terrestrial interactions N81-31755
Hydro-climatic variability in the equatorial Atlantic Correlation with solar activity N81-31756
The 200, 22 and 11 year cycles and long series of climatic data, mainly since 200 AD --- atmospheric pressure N81-31757
Effects of the solar magnetic field on the semiannual intensity of the green coronal line N81-31758
Quasi-biennal oscillation of solar activity and its control of the Earth's climate --- solar neutrinos N81-31761
Solar activity and variations of meteorological parameters --- climate N81-31765
Long term variations of the solar constant --- solar models N81-31767
Solar luminosity variation on directly observable time scales: observational evidence and basic mechanisms N81-31769
Structural variability of the Sun --- radius and luminosity N81-31770
Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771
Beryllium-10 as a potential probe of solar variability influence on climate N81-31772
Formation of the Earth and alteration of the climate N81-31773
Fluctuations, solar periodicities, and climatic transitions --- climate modeling N81-31777
Working group 2: Physical mechanisms N81-31779
Working group 3: Space measurements --- solar constant, experiments N81-31780
A review of observational evidence for short and long term ultraviolet flux variability of the Sun N81-31783
PERSONALITY TESTS
The effects of gender and instructions on calibration
[AD-A102255] N81-31844
PERSONNEL SELECTION
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
PERTURBATION
Preliminary experimental study of disturbances in a laminar boundary-layer due to distributed surface roughness
[AD-A102072] N81-31513
PETROLEUM PRODUCTS
World petroleum outlook, 1981
[PUBL-97-4] N81-31608
PHASE DETECTORS
High stability buffered phase comparator
[NASA-CASE-GSC-12645-1] N81-31482
PHASE LOCKED SYSTEMS
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528
Analysis of a phase-locked loop to suppress interference from a solar power satellite
[PB81-193781] N81-31675
PHASE TRANSFORMATIONS
Heat transfer in developing laminar pipe flow: With or without a phase change material around the pipe N81-31504
Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high tempeature excursions
[UCRL-53074] N81-31542
Critical dynamics of liquid crystal above the isotropic-nematic phase transition N81-32043
Theory of phase transitions in chemisorbed two-dimensional systems N81-32046
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
PHONOCARDIOGRAPHY
The application of cardiograms in the valuation of navigation personnel N81-31830
PHOSPHINES
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines
[DOE/ER-03416/21] N81-31325
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-1] N81-31364
PHOSPHORUS COMPOUNDS
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618
PHOTOCATHODES
Space Telescope digicon technology
[NASA-CR-166704] N81-32096
PHOTOCHEMICAL OXIDANTS
Guideline for applying the the Airshed Model to urban areas
[PB81-200529] N81-31699
PHOTOCHEMICAL REACTIONS
Photoegeneration of reactive organometallic species
[AD-A102069] N81-31286
Photochemistry of surface-confined organometallics: Photochemical release of a surface-confined cobalt carbonyl catalyst
[AD-A102112] N81-31317
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines
[DOE/ER-03416/21] N81-31325
Photoinitiated doping of polyacetylene
[AD-A102291] N81-31369
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
PHOTODIODES
Thermal infrared array, phase 1. Volume 1: Technical
[NASA-CR-166705] N81-31991
PHOTOELECTRIC EMISSION
Optimal point process estimators for Gaussian optical field intensities N81-31989
PHOTOELECTROCHEMICAL DEVICES
Investigation of photoelectrochemical corrosion of semiconductors
[SERI/TR-8002-6-T1] N81-31347
PHOTOELECTROCHEMISTRY
Investigation of photoelectrochemical corrosion of semiconductors
[SERI/TR-8002-6-T1] N81-31347
PHOTOELECTRON SPECTROSCOPY
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285
Photoelectron emission spectroscopy of aqueous solutions
[AD-A102426] N81-31313
PHOTOINTERPRETATION
Interpretation of hydrographic features seen in the waters off Cape Cod
[AD-A102343] N81-31803
Image understanding research
[AD-A102471] N81-31893
PHOTOLUMINESCENCE
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017
PHOTOMASKS
Space Telescope digicon technology
[NASA-CR-166704] N81-32096
PHOTOSPHERE
Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108
PHOTOVOLTAGES
Analysis and test of line-commutated inverters for use in photovoltaic power systems
[DOE/ET-20279/115] N81-31491
PHOTOVOLTAIC CELLS
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641
Highlights of NASA/DOE photovoltaics market assessment visit to Colombia
[NASA-TM-84011] N81-32081

PHOTOVOLTAIC CONVERSION
Commercialization of a photovoltaic concentrator: Acurex report
[SAND-80-7082] N81-31665
PHYSICAL CHEMISTRY
Characterization of the physico-chemical properties of polymeric materials for aerospace flight --- nickel cadmium batteries
[NASA-CR-160070] N81-31362
PHYSIOLOGICAL EFFECTS
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810
Lasers and protection of the eyes N81-31854
PHYSIOLOGICAL TESTS
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
PILOT PERFORMANCE
Voice warning systems: Some experimental evidence concerning application N81-31458
Modeling the effects of sustained accelerations on pilot tracking performance N81-31839
PILOT PLANTS
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396
PILOT TRAINING
Flight simulator: Use of spacegraph display in an instructor/operator station
[AD-A101951] N81-31235
PILOTS
Information transfer within the cockpit: Problems in intracockpit communications N81-31167
Cardiovascular problems during the pilots career N81-31837
PIONS
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487
Hyperpions at the Z(0)
[DOE/ER-01545/306] N81-31968
PIPE FLOW
Heat transfer in developing laminar pipe flow: With or without a phase change material around the pipe N81-31504
PIPELINES
Alternate fuels manufactured from high temperature solar thermal systems
[DOE/ET-21067/2] N81-31397
PIPES (TUBES)
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting
[NASA-TM-82429] N81-31402
Dynamic response of tuned secondary systems N81-31567
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585
PLANE WAVES
Electromagnetic fields resulting from simple acceleration N81-31413
Study of antenna radome problems
[AD-A102205] N81-31432
PLANETARY EVOLUTION
Formation of the Earth and alteration of the climate N81-31773
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106
PLANETARY GRAVITATION
A numerical model study of long-term planetary wave predictability N81-31710
PLANETARY RADIATION
Decameter-wave radio observations of Jupiter during the 1977 apparition
[NASA-TM-84012] N81-32095
PLANKTON
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618
PLANT DESIGN
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results
[NASA-CR-165235] N81-31632
PLANT STRESS
Hierarchical set of models for estimating the effects of air pollution on vegetation
[UCRL-85367] N81-31682
PLASMA CLOUDS
Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963
PLASMA CONTROL
Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
Particle-confinement criteria for axisymmetric field-reversed magnetic configurations
[CONF-810450-1] N81-31977
PLASMA DECAY
Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036
PLASMA DENSITY
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear
[LA-8828-MS] N81-32037
PLASMA DIAGNOSTICS
Joint European Torus (JET) design study 8.3: Quasi-continuous laser scattering. Part 2: Extension to spatial scan
[IPF-81-3-PT-2] N81-31544
Doppler ion program description --- to measure plasma ion temperature
[GA-A-16140] N81-31973
Comparison of measured emittance of an h(-) ion beam with a simple theory
[LA-8808-MS] N81-31974
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator
[LA-UR-81-1442] N81-32029
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear
[LA-8828-MS] N81-32037
PLASMA EQUILIBRIUM
Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036
PLASMA GUNS
Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036
PLASMA HEATING
Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031
PLASMA LAYERS
Double layers in the laboratory and above the aurora --- plasma layers
[TRITA-EPP-80-12] N81-31735
PLASMA PHYSICS
Evaluation of some geophysical events on 22 September 1979
[LA-8672] N81-31728
Modular coils: A promising toroidal-reactor-coil system
[PPPL-1796] N81-32034
Reports from the Departments of Electron and Plasma Physics: Index and Abstracts, 1980
[TRITA-EPP-80-13] N81-32042
PLASMA PINCH
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator
[LA-UR-81-1442] N81-32029
PLASMA PROBES
Laser excited fluorescence as a plasma probe: Stochastic interpretations of preliminary experimental observations N81-31303
Doppler ion program description --- to measure plasma ion temperature
[GA-A-16140] N81-31973
Advanced development of particle-beam-probe diagnostic systems
[DOE/ET-53004/20] N81-31981
PLASMA SPRAYING
Automated Plasma Spray (APS) process feasibility study
[NASA-CR-165418] N81-31193
Delayed failure characteristics of plasma-sprayed aluminum oxide applied to stainless steel and titanium alloy substrates in various physiological media N81-31332
PLASMA WAVES
On solitary kinetic Alfven waves in a magnetized plasma N81-32025
PLASMA-PARTICLE INTERACTIONS
Electric fields in Earth orbital space
[AD-A102550] N81-32101
PLASMAS (PHYSICS)
Computer simulation techniques for artificial modification of the ionosphere
[AD-A102302] N81-31722
Laser heating of aluminum exploding wire plasmas N81-32022
PLASTIC DEFORMATION
National Transonic Facility Fan Blade prepreg material characterization tests
[NASA-TM-81800] N81-31227
Strain-hardening and rate effects in plasticity N81-31569
Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582
PLASTICS
Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299
PLATE THEORY
Theoretical and experimental study of the behavior of reinforced plastic plates. Part 1: General theory
[CRIF-PL-14-PT-1] N81-31587
PLATES (STRUCTURAL MEMBERS)
Plate bending finite element based on the extended field method N81-31573
PLATING
Progress in the battle with the burr
[BDX-613-2306] N81-31552
PLATINUM
Hydrogen in metals N81-31335
Nuclear magnetic resonance of platinum catalysts: The discovery of the surface resonance N81-32045
PLUTONIUM
Dispersion of radioactive pollutant in a tornadic storm
[DP-1556] N81-31687
PNEUMATICS
Development of an autonomous experiment on the measurement of friction losses of pneumatic transport under reduced gravity N81-31246
POINT DEFECTS
Theoretical calculations of the electronic and vibrational structure of point defects in ionic crystals
[CONF-810573-1(DRAFT)] N81-32067
POISSON DENSITY FUNCTIONS
Multi-server queues
[AD-A101851] N81-31906
Order restricted statistical tests on multinomial and Poisson parameters: The starshaped restriction
[AD-A102562] N81-31936
The development and application of a disaggregate Poisson model for trip generation
[IWIS-A-80-VK-01-01] N81-32090
POLAR COORDINATES
Pole position for 1980 based on Doppler observations of the GEOS-3 Satellite
[AD-A102548] N81-31727
POLARIZATION
Electrode polarization studies in hot corrosion systems --- molten salt electrolytes N81-31337
POLARONS
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017
POLICIES
Communications research and development
[GPO-66-114] N81-31422
POLITICS
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 2: Social meanings of energy
[DOE/TIC-1022360] N81-31647
POLLUTION CONTROL
Exhaust sensor for heating systems --- combustion optimization and pollution control
[BMFT-FB-T-80-054] N81-31326

A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679
Oil shale surface retorting: Environmental Characterization Information Report [DOE/EP-0015] N81-31685
Evaluation of emissions and control technology for industrial stoker boilers [PB81-197873] N81-31696
Controlling sulfur oxides [PB81-200800] N81-31700
Evaluation of maintenance for fugitive VOC emission control [PB81-206005] N81-31702
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile [NASA-CR-165281] N81-32088

POLLUTION MONITORING
Atmospheric measurements of selected hazardous organic chemicals [PB81-200628] N81-31328
Water resources data for Maryland and Delaware, water year 1980 [PB81-195885] N81-31616
Lake Michigan intensive survey 1976-1977 [PB81-196636] N81-31618
Development of measurement methodology for, evaluating fugitive particulate emissions [PB81-196594] N81-31690
Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7 [PB81-196628] N81-31692
Cost effective stream and effluent monitoring [PB81-202210] N81-31701
The measurement and identification of ultrafine aerosols in polluted air [PB81-198673] N81-31703
Remote atmospheric measurments with a tunable infrared laser source --- pollution monitoring N81-31985

POLLUTION TRANSPORT
Interchange of pollutants between groundwater and and mineral strata as applied to waste chemical dumps and in situ coal gasification sites [PB81-198335] N81-31697
Guideline for applying the the Airshed Model to urban areas [PB81-200529] N81-31699
Guideline for fluid modeling of atmospheric diffusion [PB81-201410] N81-31739

POLYCRYSTALS
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624

POLYIMIDES
The effect of elastomer chain length on properties of silicone-modified polyimide adhesives [NASA-TM-83172] N81-31360

POLYMER CHEMISTRY
Thermodynamics and diffusion in polymer solutions containing associating species N81-31358
Photoinitiated doping of polyacetylene [AD-A102291] N81-31369
Structure and properties of polymers and organosilanes absorbed onto oxidized aluminum and titanium [AD-A102365] N81-31370
Polyacrylamide polymer viscosity as a function of brine composition [DOE/BETC/RI-80/12] N81-31373

POLYMER PHYSICS
Measurement of thermodynamic quantities of polymer systems --- characterizing the miscibility [MS-1240] N81-31377

POLYPHENYLS
Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer [AD-A102290] N81-31367

POLYSTYRENE
Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306
Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359
Solar central receiver heliostat mirror module development [SAND-79-8189] N81-31656

POLYTETRAFLUOROETHYLENE
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites [RAE-TR-75144] N81-31297

POLYURETHANE FOAM
Unsteady thermal stress analysis of a cryogenic foam insulation element [DFVLR-FB-81-17] N81-31378

POPULATIONS
Predicting unit variate values in a finite population N81-31925
An asymptotic expansion of the distribution of the weighted-difference classification criterion for discrimination of two and three multivariate normal populations N81-31926

POROSITY
Porosity of welds --- under reduced gravity N81-31255
Stress-assisted diffusion and consolidation with double porosity N81-31561

PORTABLE EQUIPMENT
Detection instrumentation for cable shield defects [PB81-194540] N81-31496

POSITION INDICATORS
Design of a laser system for instantaneous location of a longwall shearer [NASA-CR-161846] N81-31607

POST-BLAST NUCLEAR RADIATION
Evaluation of some geophysical events on 22 September 1979 [LA-8672] N81-31728

POTENTIAL FLOW
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow [NASA-CR-3466] N81-31127

POTENTIOMETERS (INSTRUMENTS)
Development and design of three monitoring instruments for spacecraft charging [NASA-TP-1800] N81-31282

POWDER METALLURGY
Living with defects in powder metallurgy materials --- turbine blades [PNR-90065] N81-31352

POWER CONDITIONING
Unequal split microwave power divider [NASA-CASE-LAR-12889-1] N81-31483

POWER EFFICIENCY
Propeller propulsion integrataion, phase 2 [NASA-CR-164730] N81-31125
High B-field, large area ratio MHD duct experiments [NASA-TM-82673] N81-32026

POWER SPECTRA
An instrument for determining coincidence and elapse time between independent sources of random sequential events [NASA-CASE-LAR-12531-1] N81-31529
Power spectra of the climatological variations in Mexico City --- solar terrestrial interactions N81-31755
Computationally fast algorithms for ARMA spectral estimation [AD-A102489] N81-31941

PRECESSION
A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record --- daily melting N81-31775

PRECIPITATION (METEOROLOGY)
The outlook for precipitation measurements from space [NASA-TM-82172] N81-31746
Hydro-climatic variability in the equatorial Atlantic Correlation with solar activity N81-31756

PRECIPITATION PARTICLE MEASUREMENT
The measurement and identification of ultrafine aerosols in polluted air [PB81-198673] N81-31703

PREDICTION ANALYSIS TECHNIQUES
Aeroelastic buffeting prediction techniques: A general review [DFVLR-FB-81-15] N81-31226
Almost sure convergence of adaptive identification prediction and control algorithms [AD-A102041] N81-31905
Predicting unit variate values in a finite population N81-31925

PREDICTIONS
The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry [PB81-200073] N81-31408

PRELAUNCH SUMMARIES
Mission operation report: SBS-B/Delta launch [NASA-TM-84014] N81-31272

PRELAUNCH TESTS
Solid rocket booster thrust vector control V-2 off-nominal testing [NASA-TM-82439] N81-31283

PREPREGS
National Transonic Facility Fan Blade prepreg material characterization tests [NASA-TM-81800] N81-31227

PRESENTATION
Transfer of information from researcher to consumer: Choosing the appropriate media [SERI/TP-513-1193] N81-32077

PRESIDENTIAL REPORTS
A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679

PRESSURE DISTRIBUTION
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow [NASA-CR-3466] N81-31127
The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin --- pressure variations, magnetic storms N81-31760

PRESSURE EFFECTS
Electronic phenomena at high pressure [DOE/ER-01198/1350] N81-31488

PRESSURE GRADIENTS
Unsteady effects of circumferential pressure distorted inlet flows in compressors [AD-A102330] N81-31514

PREVENTION
Epidemiological basis for the prevention of coronary heart disease N81-31835
Prevention of cardiovascular diseases N81-31836

PRINTERS (DATA PROCESSING)
Development of an electrostatic printing process with gas discharge recording writing head [BMFT-FB-T-80-084] N81-31494

PROBABILITY DENSITY FUNCTIONS
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates [AD-A102413] N81-31940

PROBABILITY DISTRIBUTION FUNCTIONS
Asymptotic (beta) subd joint normality of sample quantiles [AD-A101991] N81-31934
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates [AD-A102413] N81-31940
Large deviation probabilities for certain dependent processes [AD-A102166] N81-31942
Large deviations for boundary crossing probabilities [AD-A102142] N81-31947

PROBABILITY THEORY
Covariance operators and their applications in probability and information theory N81-31923

PROBLEM SOLVING
Selection procedures for a problem in analysis of variance [AD-A101922] N81-31931

PROCESS CONTROL (INDUSTRY)
Case studies in computer control --- process control [RR-145] N81-31910

PRODUCT DEVELOPMENT
National Transonic Facility Fan Blade prepreg material characterization tests [NASA-TM-81800] N81-31227
Resin composition, process for producing the same, product produced therefrom and process for producing said product [NASA-CASE-ARC-11331-1] N81-31363
Phosphorus-containing imide resins [NASA-CASE-ARC-11368-1] N81-31364

PRODUCTION COSTS
COthane, methane from waste CO [DOE/CS-40177/T2] N81-31396

PRODUCTION MANAGEMENT
An approach to the generation of software life cycle support systems N81-31877
PROGRAM VERIFICATION (COMPUTERS)
Evaluation of natural language processors N81-31858
JOVIAL (J73) computer validator [AD-A102386] N81-31867
FAVS enhancements [AD-A102218] N81-31883
An approach to reliable integration testing [AD-A102477] N81-31886
Abstration, inspection and debugging in programming [AD-A102157] N81-31888
SNIFFER: A system that understands bugs [AD-A102158] N81-31889
Analyzing a syntactic family of complexity metrics --- quantifying the complexity of computer programs [AD-A101920] N81-31890
Transformational implementation: An example [AD-A101994] N81-31891
PROGRAMMING LANGUAGES
JOVIAL (J73) computer validator [AD-A102386] N81-31867
Communicating distributed processes: A programming language concept for distributed systems N81-31874
SCRIBE: A document specification language and its compiler N81-31875
Event-analysis language for high-speed data acqusition [LA-UR-81-1550] N81-31894
Abstract storage structures --- programming languages, abstract data types [MC-IW-158/81] N81-31901
Issues in the design of a beginners' programming language [MC-IW-161/81] N81-31902
From Van Wijngaarden-grammar to ALEPH --- programming languages, hierarchies [MC-IW-162/81] N81-31903
PROJECT MANAGEMENT
Current problems in the German program on materials research and processing technology in space N81-31242
Projects and plans of the German program on materials research and processing technology in space N81-31243
PROJECT PLANNING
Wisconsin manual to coordinate elderly and handicapped transportation services in rural and small urban counties [PB81-197865] N81-32091
PROJECTILES
Generalized dynamic stability for linearized yawing motion --- The stability of spinning projectiles [RMCS-80002] N81-31225
Modelling penetration by slender high kinetic energy projectiles [MRL-R-811] N81-31546
PROPAGATION MODES
Modal noise in optical fibers and signal fluctuations in an underground laid optical cable [FUB-44-1980] N81-32010
Modal noise in optical fibers --- statistical analysis, propagation modes N81-32011
PROPELLANT TANKS
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system [AD-A102320] N81-31268
PROPELLER EFFICIENCY
Propeller propulsion integrataion, phase 2 [NASA-CR-164730] N81-31125
PROPERTIES
Electron transport, chemistry and optical emissions in the auroral E-layer [AD-A102345] N81-31725
PROPULSION SYSTEM CONFIGURATIONS
Space Shuttle news reference [NASA-TM-82290] N81-31276
PROPULSION SYSTEM PERFORMANCE
Propeller propulsion integrataion, phase 2 [NASA-CR-164730] N81-31125
Advanced subsonic transport propulsion [NASA-TM-82696] N81-31195
Helicopter propulsion system reliability and engine monitoring assessments N81-31213
Engine health monitoring: An advanced system N81-31216
On the calculation of thrust coefficient [PERME-MEMO-150] N81-31284
The data processing system at FOA Institution 27. Software organization principles [FOA-C-20361-D3] N81-32074
PROTECTIVE COATINGS
Improving turbine engine compressor performance retention through airfoil coatings N81-31203
An introduction to NASA's turbine engine hot section technology (HOST) project N81-31206
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings [DOE/ET-10245/1-VOL-1] N81-31350
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings [DOE/ET-10245/1-VOL-2] N81-31351
Development of silane-hydrolysate binder for UV-resistant thermal control coatings [NASA-TP-1900] N81-31365
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared [RSRE-MEMO-3295] N81-32021
PROTEINS
Biochemical preparatory and analytical developments and plans in connection with the Spacelab programs --- protein crystal growth N81-31261
Protein crystal growth under space conditions N81-32009
PROTON IRRADIATION
Proton-induced noise in digicons [NASA-TP-1852] N81-31281
PSYCHOACOUSTICS
Sidetone-level considerations in aircraft communication systems N81-31475
PSYCHOLOGICAL FACTORS
The effects of gender and instructions on calibration [AD-A102255] N81-31844
PSYCHOLOGICAL TESTS
Estimation in latent trait models [AD-A102216] N81-31937
PSYCHOMETRICS
Estimation in latent trait models [AD-A102216] N81-31937
PSYCHOPHYSICS
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics [FOA-C-53004-H9] N81-31845
PSYCHOPHYSIOLOGY
Training for relaxation. An experiment at the military flight school [FOA-C-59003-H9] N81-31841
PUBLIC HEALTH
Doing a risk analysis [CONF-810480-1] N81-31822
PULMONARY LESIONS
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817
PULSE COMMUNICATION
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test [NASA-CR-3461-VOL-1] N81-31171
Technical advisory panel on the digital data communications network [GPO-75-433] N81-31420
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474
PULSE HEATING
Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high tempeature excursions [UCRL-53074] N81-31542
PULSED LASERS
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535
PUMPS
A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547
PYROTECHNICS
Measurements of the size distribution and solubility of Salty Dog pyrotechnic [AD-A102547] N81-31388
PYRROLES
Electrical properties of pyrrole and its copolymers [AD-A102292] N81-31368

Q

Q VALUES
Thresholds and Q values of nuclear reactions induced by neutrons, protons, deuterons, tritons He-3 ions, alpha particles, and photons, volume 24 [UCRL-50400-VOL-24] N81-31979
QUADRATURES
Research on numerical algorithms for large space structures [NASA-CR-164721] N81-31911
QUALITY
A United Kingdom view on future fuels [PNR-90068] N81-31398
QUALITY CONTROL
Failure of morphology of (0 deg)8 graphite/epoxy as influenced by environments and processing [NASA-TM-81318] N81-31289
Living with defects in powder metallurgy materials --- turbine blades [PNR-90065] N81-31352
QUANTUM CHROMODYNAMICS
Quark-antiquark potential and quantum chromodynamics [FERMILAB-CONF-81/38-THY] N81-31969
QUANTUM EFFICIENCY
Analysis of an electro-optical satellite observation [AD-A102514] N81-32014
QUANTUM MECHANICS
Metallic hydrogen: A two-body approach to band theory and a quantum mechanical test of Diophantine methods N81-32055
QUANTUM STATISTICS
Fixed points: Fermion mass predictions [FERMILAB-CONF-81/44-THY] N81-31962
QUANTUM THEORY
Casimir self-stress on a perfectly conducting cylindrical shell [DOE/ER-01545-308] N81-31584
Long-range interactions in lattice field theory [SLAC-240] N81-32069
Quantum conformal fluctuations near the classical space-time singularity [PREPRINT-64] N81-32071
QUARKS
Partially conserved axial-current noncanonicality and the Sigma commutator [DOE/ER-05126/T2] N81-31487
Quark-antiquark potential and quantum chromodynamics [FERMILAB-CONF-81/38-THY] N81-31969
QUEUEING THEORY
Multi-server queues [AD-A101851] N81-31906

R

RADAR
The outlook for precipitation measurements from space [NASA-TM-82172] N81-31746
RADAR ANTENNAS
Study of antenna radome problems [AD-A102205] N81-31432
RADAR IMAGERY
Development of a ground signal processor for digital synthetic array radar data [NASA-CR-161074] N81-31421
RADAR TRACKING
Wind measurements by parachute [FOA-C-20344-D2] N81-31748
RADIATION BELTS
Proton-induced noise in digicons [NASA-TP-1852] N81-31281

Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963

RADIATION CHEMISTRY
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines
[DOE/ER-03416/21] N81-31325

RADIATION DOSAGE
Toward a theory of the initiation of cancer by ionizing radiation: Track structure analysis for electrons and alpha particles in water
[CONF-800944-8] N81-31821
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model
[CONF-800944-7] N81-31823
Health effects of low-level radiation
[CONF-810606-47] N81-31824

RADIATION EFFECTS
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels
[DOE/EV-10503/1] N81-31815

RADIATION HARDENING
Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065

RADIATION HAZARDS
Health effects of low-level radiation
[CONF-810606-47] N81-31824
An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826

RADIATION PRESSURE
Application of radiation pressure measurements to the monitoring of the solar constant --- satellite borne accelerometer N81-31782

RADIATION SHIELDING
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820

RADIATIVE TRANSFER
Solar luminosity variation on directly observable time scales: observational evidence and basic mechanisms N81-31769

RADII
Structural variability of the Sun --- radius and luminosity N81-31770

RADIO ALTIMETERS
Ice sheet altimetry
[NASA-CR-156877] N81-31605

RADIO ASTRONOMY
Decameter-wave radio observations of Jupiter during the 1977 apparition
[NASA-TM-84012] N81-32095
Study of geomagnetic storms, solar flares, and centers of activity in 1977
[AD-A102301] N81-32109

RADIO COMMUNICATION
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453

RADIO ECHOES
Investigation of turbulence according to fluctuating radio reflections --- meteor trails, atmospheric turbulence
[PNR-90063] N81-31793

RADIO FREQUENCIES
High stability buffered phase comparator
[NASA-CASE-GSC-12645-1] N81-31482

RADIO FREQUENCY INTERFERENCE
Analysis of a phase-locked loop to suppress interference from a solar power satellite
[PB81-193781] N81-31675
Analysis of interference caused by the Solar Power Satellite to satellite earth terminals
[PB81-194268] N81-31676
Analysis of interference from the Solar Power Satellite to general electronics systems
[PB81-194250] N81-31677

RADIO WAVE REFRACTION
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting
[AD-A102309] N81-31802

RADIOACTIVE CONTAMINANTS
Dispersion of radioactive pollutant in a tornadic storm
[DP-1556] N81-31687

RADIOACTIVE MATERIALS
A review of The Department of Transportation regulations for transportation of radioactive materials, revised 1980 N81-31161
Safety locking device between sealed vessels --- for handling radioactive materials
[BLL-RISLEY-4270-(9091.9F)] N81-31545

RADIOACTIVE WASTES
Environmental analysis burial of offsite low-level waste at SRP
[DPST-80-466] N81-31982

RADOMES
Study of antenna radome problems
[AD-A102205] N81-31432

RAIL TRANSPORTATION
Alternate fuels manufactured from high temperature solar thermal systems
[DOE/ET-21067/2] N81-31397

RAIN
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445
Rainfall patterns in South Africa, southeastern Australia and New Zealand N81-31754

RAINDROPS
Scattering and absorption of electromagnetic waves by spheroidal raindrops
[REPT-455-TBR-67] N81-31441

RAMAN SPECTRA
Matrix isolation spectra and structures of unstable molecules N81-31961

RAMJET ENGINES
Combustion in high speed air flows
[AD-A102336] N81-31320

RANDOM NOISE
Similarity of distorted pictures: On the interaction between edge blur and random noise --- psychophysics
[FOA-C-53004-H9] N81-31845

RANDOM PROCESSES
Long unimodal subsequences: A problem of F. R. K. Chung
[AD-A102168] N81-31914

RANDOM VARIABLES
Long unimodal subsequences: A problem of F. R. K. Chung
[AD-A102168] N81-31914
Predicting unit variate values in a finite population N81-31925
Generalized Blomqvist correlation --- detecting edges in computer image processing
[AD-A102058] N81-31939

RANDOM WALK
Large deviations for boundary crossing probabilities
[AD-A102142] N81-31947

RANGE SAFETY
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system
[AD-A102320] N81-31268

RANGELANDS
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595

RANK TESTS
A parametric analysis of structured and unstructured Q-sort data
[AD-A102169] N81-31944

RANKINE CYCLE
Storage in residential solar total-energy systems
[BNL-51230] N81-31658

RANKING
Some locally optimal subset selection rules
[AD-A101923] N81-31932

RARE EARTH COMPOUNDS
The 4th International Workshop on Rare-Cobalt Permanent Magnets and their Application
[PB81-196024] N81-31955

RARE GAS-HALIDE LASERS
Electron beam pumped tunable excimer lasers N81-31533

RARE GASES
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175
Inert gases in fifteen iron meteorites N81-32103

RAREFIED GASES
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506

RATS
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810

RAWINSONDES
Further analysis of tropical cyclone characteristics from rawinsonde compositing techniques
[AD-A102053] N81-31785

RAYLEIGH SCATTERING
Applications of Rayleigh scattering to turbulent flows with heat transfer and combustion
[AD-A102176] N81-31510
Recoilless Rayleigh scattering from pure single crystals of Barium titanate near the 130 deg C ferroelectric Curie point N81-32051

RAYLEIGH-RITZ METHOD
Global function approach in structural analysis: Basic approach, numerical results
[NASA-CR-165669] N81-31579

RDX
Detonation characteristics of dust dispersed in air
[AD-A102507] N81-31387

REACTION KINETICS
Kinetics of phase separation in fluid mixtures --- influence of weightlessness N81-31248
Reaction kinetics in molten glasses N81-31265
Reactions of free radicals with nitro-compounds and nitrates
[AD-A102286] N81-31314
Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318
Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394
Statistical constraints on scalar variables in turbulent flows
[AD-A102342] N81-31515
Sulfur dioxide oxidation reactions in aqueous solutions
[PB81-196834] N81-31738
Space experiments on dissipative structures N81-32005

REACTION TIME
The speed of response to synthesized voice messages N81-31456

REACTIVITY
Photoegeneration of reactive organometallic species
[AD-A102069] N81-31286
Electronic phenomena at high pressure
[DOE/ER-01198/1350] N81-31488
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070

REACTOR MATERIALS
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results
[EPRI-NP-1534-VOL-2] N81-31530

REACTOR TECHNOLOGY
Status of the Tokamak program
[ORNL/TM-7778] N81-32039

REAL TIME OPERATION
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
The utilization of microprocessors in real time numerical signal processing --- digital filters
[FUB-49-1979] N81-31870

RECEIVERS
Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180

RECEPTION DIVERSITY
Space diversity experiments on a 20 kilometer long 15 GHz link --- reduction of mutipath fading
[REPT-455-TBR-70] N81-31442

RECURSIVE FUNCTIONS
An adaptive ARMA spectral estimator, part 2
[AD-A101870] N81-31949

REDOX CELLS
Design and assembly considerations for Redox cells and stacks
[NASA-TM-82672] N81-31308
REDUCED GRAVITY
Space life sciences --- definition - experiment proposals N81-31244
Performing experiments under space flight conditions in the domain of chemical engineering N81-31245
Development of an autonomous experiment on the measurement of friction losses of pneumatic transport under reduced gravity N81-31246
Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Kinetics of phase separation in fluid mixtures --- influence of weightlessness N81-31248
Gas bubble formation in electrolytes under reduced gravity N81-31249
Multiple purpose facilities for materials science experiments in space N81-31251
Porosity of welds --- under reduced gravity N81-31255
Convection in a floating zone without rotation --- on Earth and under reduced gravity N81-31263
Interface convection under microgravity conditions N81-31999
Cell convection of reduced gravity --- in crystal melts N81-32003
Measurement of the boundary layer adherent to the electrodes of an electrolytic cell --- under reduced gravity N81-32006
Growth of silicon crystals --- under reduced gravity N81-32008
Protein crystal growth under space conditions N81-32009
REDUCTION (CHEMISTRY)
Method for preparing ferrochromium alloys by vacuum reduction and simple melting of reduced products
[PB81-197196] N81-31357
REDUNDANT COMPONENTS
An introduction to a reliability shorthand
[AD-A102372] N81-31558
REENTRY VEHICLES
High Reynolds number research requirements for space vehicle design N81-31151
REFLECTANCE
Change in reflectivity of metals under intense laser radiation, revision
[AD-A102005] N81-31342
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021
REFRACTION
Conventional optical correction of ametropias in aeronautics N81-31850
REFRACTORY COATINGS
Microstructure and mechanical properties of bulk yttria-partially-stabilized zirconia
[NASA-CR-165402] N81-31340
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings
[DOE/ET-10245/1-VOL-2] N81-31351
REFRIGERATORS
The APL satellite refrigerator program
[AD-A102377] N81-31274
REGIONAL PLANNING
Overview of energy-conserving development planning and design techniques based on five case studies
[ANL/CNSV-TM-59] N81-31644
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
District heating: Air-quality considerations and the Clean Air Act
[BNL-51361] N81-31683
REGOLITH
Thermal conduction in a composite circular cylinder: A new technique for thermal conductivity measurements of lunar core samples
[NASA-TM-82331] N81-31500
REGRESSION ANALYSIS
Applications of multiproperty analysis in the prediction of complex-system thermophysical behavior N81-31301
A regression analysis model with some transformations of the variables involved --- application to impact prediction
[FOA-C-20332-D8] N81-31917
On multiple comparisons --- significance tests N81-31921
An adaptive ARMA spectral estimator, part 1
[AD-A101869] N81-31927
Some sequential selection procedures for good regression models
[AD-A101921] N81-31930
On eliminating inferior regression models
[AD-A101924] N81-31933
An algorithm for isotonic regression in the plane
[AD-A102559] N81-31935
Computationally fast algorithms for ARMA spectral estimation
[AD-A102489] N81-31941
The classification and mixture maximum likelihood approaches to cluster analysis
[AD-A102084] N81-31946
An adaptive ARMA spectral estimator, part 2
[AD-A101870] N81-31949
REGULATIONS
NATO regulations on the cardio-vascular system N81-31829
REGULATORS
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952
REINFORCEMENT (STRUCTURES)
Analysis and design of continuously reinforced concrete pavements N81-31564
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
REINFORCING FIBERS
Resin composition, process for producing the same, product produced therefrom and process for producing said product
[NASA-CASE-ARC-11331-1] N81-31363
RELATIVITY
Quantum conformal fluctuations near the classical space-time singularity
[PREPRINT-64] N81-32071
RELAXATION (PHYSIOLOGY)
Training for relaxation. An experiment at the military flight school
[FOA-C-59003-H9] N81-31841
RELIABILITY
An introduction to a reliability shorthand
[AD-A102372] N81-31558
Reliability of ultrasonic weld interrogation methods, phase 1
[PB81-194177] N81-31560
RELIABILITY ANALYSIS
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
RELIABILITY ENGINEERING
Advances in inertial navigation systems and components
[AGARD-AG-254] N81-31172
Aircraft Engine Diagnostics
[NASA-CP-2190] N81-31196
A-10/TF34 Turbine Engine Monitoring System (TEMS) N81-31211
Review of AIDS development --- airborne computers for reliability engineering N81-31212
Helicopter propulsion system reliability and engine monitoring assessments N81-31213
Engine health monitoring systems: Tools for improved maintenance management in the 1980's N81-31214
Engine condition monitoring: CF6 family 60's through the 80's N81-31215
Engine health monitoring: An advanced system N81-31216
REMOTE CONTROL
A study of the control principles of remotely controlled LV air defense missiles
[FOA-C-30180-E3] N81-31275
REMOTE SENSING
Proton-induced noise in digicons
[NASA-TP-1852] N81-31281
Satellite measurements of tropospheric aerosols
[NASA-CR-3459] N81-31680
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796
REMOTE SENSORS
Advanced development of particle-beam-probe diagnostic systems
[DOE/ET-53004/20] N81-31981
Remote atmospheric measurments with a tunable infrared laser source --- pollution monitoring N81-31985
Design of a spaceborne lightning sensor N81-31987
REPRESENTATIONS
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems --- digital systems
[FUB-3-1981] N81-31920
RESEARCH
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
RESEARCH AND DEVELOPMENT
Industrial innovation
[GPO-70-074] N81-31403
Communications research and development
[GPO-66-114] N81-31422
RESEARCH FACILITIES
National icing facilities requirements investigation
[AD-A102520] N81-31238
Activities report on aerospace and energy research N81-31672
RESERVES
World petroleum outlook, 1981
[PUBL-97-4] N81-31608
RESERVOIRS
Resource assessment of low- and moderate-temperature geothermal waters in Calistoga, Napa County, California. Report of the second year, 1979 to 1980 of the US Department of Energy - California State-Coupled Program for reservoir assessment and confirmation
[DOE/ET-27035/T1] N81-31609
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662
RESIDENTIAL AREAS
A dynamic model of the urban process
[PB81-196990] N81-31694
RESIDENTIAL ENERGY
Experimentally determined performance of some residential circuit breakers
[PB81-197048] N81-31498
Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666
RESIDUAL STRESS
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287
Acoustoelastic measurement of residual stresses N81-31571
RESIN MATRIX COMPOSITES
Hybridized polymer matrix composites
[NASA-CR-165339] N81-31361
RESINS
Silicone modified resins for graphite fiber laminates
[NASA-CR-165451] N81-31290
Resin composition, process for producing the same, product produced therefrom and process for producing said product
[NASA-CASE-ARC-11331-1] N81-31363
Phosphorus-containing imide resins
[NASA-CASE-ARC-11368-1] N81-31364
RESONANCE
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267
RESONANCE SCATTERING
Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations
[LA-UR-81-1247] N81-32110
RESONANT VIBRATION
Resonators with small apertures N81-31572

RESOURCES MANAGEMENT
Resource assessment of low- and moderate-temperature geothermal waters in Calistoga, Napa County, California. Report of the second year, 1979 to 1980 of the US Department of Energy - California State-Coupled Program for reservoir assessment and confirmation
[DOE/ET-27035/T1] N81-31609
Resource Conservation and Development Act
[GPO-67-017] N81-32083
RESPIRATION
The application of cardiograms in the valuation of navigation personnel N81-31830
RESPIRATORY DISEASES
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681
RESTORATION
Precipitation and inactivation of phosphorus as a lake restoration technique
[PB81-196511] N81-31617
Covering bottom sediments as a lake restoration technique
[PB81-200453] N81-31620
RETORT PROCESSING
Oil shale surface retorting: Environmental Characterization Information Report
[DOE/EP-0015] N81-31685
RETROREFLECTION
Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603
REVERSE FIELD PINCH
Particle-confinement criteria for axisymmetric field-reversed magnetic configurations
[CONF-810450-1] N81-31977
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear
[LA-8828-MS] N81-32037
REYNOLDS NUMBER
High Reynolds number research - 1980
[NASA-CP-2183] N81-31130
The National Transonic Facility: Review and status report N81-31131
The NTF as a national facility N81-31132
NTF and the Department of Defense N81-31133
NTF management considerations N81-31134
Pathfinder model program for the National Transonic Facility N81-31135
Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136
Instrumentation systems for the National Transonic Facility N81-31137
Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138
Onset of condensation effects in cryogenic wind tunnels N81-31139
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Wall interference effects: Status review N81-31141
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142
Aircraft design using the National Transonic Facility N81-31143
Proposed aeroelastic and flutter tests for the National Transonic Facility N81-31144
Preliminary user planning for the NASA National Transonic Facility N81-31145
Report of the panel on fluid dynamics N81-31146
High lift technology N81-31147
Configuration aerodynamics N81-31148
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
Report of the wind tunnel/flight correlation panel N81-31150
High Reynolds number research requirements for space vehicle design N81-31151
Report of the panel on theoretical aerodynamics N81-31152
Gortler vortices and transition in wall boundary layers of two Mach 5 nozzles
[NASA-TP-1869] N81-31509
RHEOLOGY
A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716
RIDING QUALITY
Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848
RIGID STRUCTURES
Summary and recommendations for the implementation of rigid pavement design, construction and rehabilitation techniques
[PB81-200578] N81-31409
RING LASERS
optical rotation rate sensors N81-31174
The four-mode linearly-polarized ring laser gyro N81-31527
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528
RISK
Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640
Doing a risk analysis
[CONF-810480-1] N81-31822
Epidemiological basis for the prevention of coronary heart disease N81-31835
RIVERS
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706
ROBUSTNESS (MATHEMATICS)
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952
ROCKET ENGINE DESIGN
The data processing system at FOA Institution 27. Software organization principles
[FOA-C-20361-D3] N81-32074
ROCKET NOZZLES
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method
[SNIAS-802-422-104] N81-31296
ROCKET PROPELLANTS
Shock development and transition to detonation initiated by burning in porous propellant beds
[AD-A102030] N81-31386
ROCKET SOUNDING
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
[NASA-CR-164724] N81-31719
ROCKET THRUST
On the calculation of thrust coefficient
[PERME-MEMO-150] N81-31284
ROCKS
Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666
ROLLER BEARINGS
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549
ROSSBY REGIMES
Normal mode global Rossby waves: Theory and observations N81-31704
ROTARY WING AIRCRAFT
National icing facilities requirements investigation
[AD-A102520] N81-31238
ROTARY WINGS
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
ROTATING LIQUIDS
Marangoni convection in a rotating melting zone N81-31264
ROTATION
Field reversal by rotating waves
[IPPJ-526] N81-32028
ROTOR AERODYNAMICS
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows
[AD-A102170] N81-31219
Aeroelastic analysis of a troposkien-type wind turbine blade
[NASA-CR-165764] N81-31629
ROTORS
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128
RURAL AREAS
Resource Conservation and Development Act
[GPO-67-017] N81-32083
Wisconsin manual to coordinate elderly and handicapped transportation services in rural and small urban counties
[PB81-197865] N81-32091
RUTILE
Electric-arc furnace processing of domestic titaniferous materials
[PB81-196727] N81-31354

S

S WAVES
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706
Deterministic methods of seismic source identification
[AD-A102333] N81-31723
SAFETY DEVICES
Safety locking device between sealed vessels --- for handling radioactive materials
[BLL-RISLEY-4270-(9091.9F)] N81-31545
SAFETY FACTORS
The use of inductive position switches in personnel safety systems
[FOA-C-30166-E5] N81-31170
Factors of safety related to structural integrity. A review of data from military airworthiness authorities
[AGARD-R-677] N81-31186
SAFETY MANAGEMENT
Hearing conservation N81-31472
Doing a risk analysis
[CONF-810480-1] N81-31822
SALINITY
Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin
[PB81-197626] N81-31737
SAMPLES
Predicting unit variate values in a finite population N81-31925
SAMPLING
Shrinkage in principal components with applications to factor analysis N81-31922
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
SANDWICH STRUCTURES
Fracture and fatigue of bi-materials
[AD-A102344] N81-31293
SATELLITE ANTENNAS
Prototype microprocessor controller --- for STDN antennas
[NASA-CR-166703] N81-31861
SATELLITE ATTITUDE CONTROL
Study of an attitude acquisition measurement technique using the ESA starmapper. Part 1: Executive summary --- computerized simulation
[NLR-TR-79116-U-PT-1] N81-31279
Study of an attitude acquisition measurement technique using the ESA starmapper, part 2
[NLR-TR-79116-U-PT-2] N81-31280
SATELLITE LIFETIME
Orbital decay in a dynamic atmosphere
[UTIAS-244] N81-31266
Life and death of artificial satellites --- perturbations and orbit decay
[AERONOMICA-ACTA-A-228-1981] N81-31269
SATELLITE OBSERVATION
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
Satellite measurements of tropospheric aerosols
[NASA-CR-3459] N81-31680
SATELLITE ORBITS
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267
SATELLITE PERTURBATION
Life and death of artificial satellites --- perturbations and orbit decay
[AERONOMICA-ACTA-A-228-1981] N81-31269
SATELLITE POWER TRANSMISSION (TO EARTH)
Analysis of a phase-locked loop to suppress interference from a solar power satellite
[PB81-193781] N81-31675
Analysis of interference caused by the Solar Power Satellite to satellite earth terminals
[PB81-194268] N81-31676

Analysis of interference from the Solar Power Satellite to general electronics systems
[PB81-194250] N81-31677
Impact of Satellite Power Systems on the ionosphere
[DOE/CH-10003/1] N81-31678

SATELLITE SOLAR POWER STATIONS
Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633

SATELLITE TELEVISION
SNIAS and the world market for application satellites --- television and communication satellites
[SNIAS-802-422-106] N81-31270
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411

SATELLITE TRACKING
Analysis of an electro-optical satellite observation
[AD-A102514] N81-32014

SATELLITE TRANSMISSION
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445

SATELLITE-BORNE INSTRUMENTS
Application of radiation pressure measurements to the monitoring of the solar constant --- satellite borne accelerometer N81-31782

SATELLITE-BORNE RADAR
Accommodations assessment: Spaceborne Doppler lidar wind measuring system
[NASA-TM-82435] N81-31744

SATELLITE-TO-SATELLITE TRACKING
Satellite To Satellite Doppler Tracking (SSDT) for mapping of the Earth's gravity field
[NASA-CR-164722] N81-31601

SATURN ATMOSPHERE
The ionosphere of Saturn N81-32104

SATURN RINGS
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106

SCALING LAWS
Report of the panel on theoretical aerodynamics N81-31152

SCATTERING AMPLITUDE
Observation of new resonance structure in the natural spin parity strange meson system
[SLAC-PUB-2729] N81-31967

SCATTERING COEFFICIENTS
Scattering and absorption of electromagnetic waves by spheroidal raindrops
[REPT-455-TBR-67] N81-31441
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts
[PB81-198293] N81-31797

SCATTERING CROSS SECTIONS
Interpretation and normalization of experimental data for total, scattering, and reaction cross sections --- fast neutron data
[CONF-800979-20] N81-31970

SCENE ANALYSIS
Image understanding research
[AD-A102471] N81-31893

SCRAP
Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355

SEA ICE
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796

SEARCHING
Evolutionary structure and search N81-31860

SEDIMENTARY ROCKS
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713

SEDIMENTS
Covering bottom sediments as a lake restoration technique
[PB81-200453] N81-31620
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809

SEISMIC WAVES
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706
Analysis of local variations in free field seismic ground motion N81-31709
Deterministic methods of seismic source identification
[AD-A102333] N81-31723

SEISMOLOGY
Seismic data analysis center
[AD-A102537] N81-31724

SELECTION
Some sequential selection procedures for good regression models
[AD-A101921] N81-31930
Selection procedures for a problem in analysis of variance
[AD-A101922] N81-31931
Some locally optimal subset selection rules
[AD-A101923] N81-31932

SELF DIFFUSION (SOLID STATE)
Generalization of the Nernst-Einstein equation for self-diffusion in high-defect-concentration solids
[CONF-810566-1] N81-32066

SEMICONDUCTING FILMS
Electrical properties of pyrrole and its copolymers
[AD-A102292] N81-31368

SEMICONDUCTOR DEVICES
Low-cost epitaxial techniques for solar-cell fabrication
[SERI/TR-8274-1-T1] N81-31650
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
[NASA-CR-164724] N81-31719
Electrical characterization of microprocessor memories
[AD-A102305] N81-31862
Electron device contact studies --- contacts to gallium arsenides
[AD-A102088] N81-32061

SEMICONDUCTORS (MATERIALS)
Melting-pot free production of 3-5 semiconductor crystals in a mirror oven --- by traveling solvent method N81-31257
Investigation of photoelectrochemical corrosion of semiconductors
[SERI/TR-8002-6-T1] N81-31347
Advanced electronic technology
[AD-A102144] N81-31484
Electronic structure of solids and their surfaces and interfaces
[AD-A101945] N81-32062

SENSORIMOTOR PERFORMANCE
The effects of altered sensory input on a skilled motor task N81-31840
Neuronal adaptive mechanisms underlying intelligent information processing
[AD-A101908] N81-31843

SENSORS
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602

SEPARATED FLOW
Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows
[AD-A102170] N81-31219

SEPARATION
Dielectrophoresis N81-31304

SEQUENCING
Long unimodal subsequences: A problem of F. R. K. Chung
[AD-A102168] N81-31914
Some sequential selection procedures for good regression models
[AD-A101921] N81-31930

SERVICE LIFE
Damage tolerance of a landing gear component after many takeoffs and landings --- nondestructive tests
[NLR-MP-79039-U] N81-31189
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585

SET THEORY
Evolutionary structure and search N81-31860
An algorithm for isotonic regression in the plane
[AD-A102559] N81-31935

SEWAGE
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643

SHADOWS
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106

SHALE OIL
Oil shale surface retorting: Environmental Characterization Information Report
[DOE/EP-0015] N81-31685
Environmental perspective on the emerging oil shale industry. Volume 2: Appendices
[PB81-196602] N81-31691

SHALES
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713
Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin
[PB81-197626] N81-31737

SHALLOW WATER
Normal mode global Rossby waves: Theory and observations N81-31704

SHAPED CHARGES
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system
[AD-A102320] N81-31268

SHEAR FLOW
Numerical experiments in homogeneous turbulence
[NASA-TM-81315] N81-31508

SHEARING
Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603
Design of a laser system for instantaneous location of a longwall shearer
[NASA-CR-161846] N81-31607

SHELLS (STRUCTURAL FORMS)
Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582
Records of Australian fouling organisms: Sessile barnacles (crustacea, cirripedia)
[MRL-R-809] N81-31809

SHIELDING
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277

SHOCK ABSORBERS
The analysis and design of shock absorbers with constant deceleration for variable loading N81-31548

SHOCK TUBES
Detonation characteristics of dust dispersed in air
[AD-A102507] N81-31387

SHRINKAGE
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295

SHROUDS
Advanced turbine blade tip seal system N81-31205

SIDE-LOOKING RADAR
Development of a ground signal processor for digital synthetic array radar data
[NASA-CR-161074] N81-31421

SIGNAL ANALYSIS
Oscillator monitor
[EGG-1183-1802] N81-31532
A small operating system for real-time runs on a Nord-10
[FOA-C-20336-E3] N81-31900

SIGNAL DETECTION
Design of a spaceborne lightning sensor N81-31987

SIGNAL FADING
Space diversity experiments on a 20 kilometer long 15 GHz link --- reduction of mutipath fading
[REPT-455-TBR-70] N81-31442

SIGNAL GENERATORS
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481

SIGNAL PROCESSING
Development of a ground signal processor for digital synthetic array radar data
[NASA-CR-161074] N81-31421

The effect of a pulsed interference signal on an adaptive array
[AD-A102258] N81-31430
Finite-sum expressions for signal detection probabilities
[AD-A102143] N81-31433
The equivalence of linearly constrained optimum array weight vectors under different optimization criteria
[AD-A102323] N81-31434
Optimum beamforming subject to multiple linear constraints
[AD-A102322] N81-31435
An algebraic approach to data-adaptive array processing
[AD-A101872] N81-31438
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
The utilization of microprocessors in real time numerical signal processing --- digital filters
[FUB-49-1979] N81-31870
Applications of periodic integrated optical structures in communication circuits --- transmission and signal processing
[REPT-465-TBR-20.] N81-32019

SIGNAL TO NOISE RATIOS
The effect of noise-induced hearing loss on the intelligibility of speech in noise N81-31460
Statistics of noise in photodetection: Applications in magneto-optical recording N81-31477
Modal noise in optical fibers and signal fluctuations in an underground laid optical cable
[FUB-44-1980] N81-32010
Modal noise in optical fibers --- statistical analysis, propagation modes N81-32011
Signal fluctuations in an underground laid optical cable --- optical measurement N81-32012

SIGNAL TRANSMISSION
Applications of periodic integrated optical structures in communication circuits --- transmission and signal processing
[REPT-465-TBR-20.] N81-32019

SIGNIFICANCE
On multiple comparisons --- significance tests N81-31921
Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945

SILANES
Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines
[DOE/ER-03416/21] N81-31325
Development of silane-hydrolysate binder for UV-resistant thermal control coatings
[NASA-TP-1900] N81-31365

SILICON
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624
Low-cost epitaxial techniques for solar-cell fabrication
[SERI/TR-8274-1-T1] N81-31650
Growth of silicon crystals --- under reduced gravity N81-32008
Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056

SILICON DIOXIDE
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295

SILICON NITRIDES
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366
High temperature mechanical properties of polyphase ceramics based on silicon nitride
[AD-A102121] N81-31372

SILICON OXIDES
Matrix isolation spectra and structures of unstable molecules N81-31961

SILICONES
Silicone modified resins for graphite fiber laminates
[NASA-CR-165451] N81-31290
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501

SIMULATION
Double layers in the laboratory and above the aurora --- plasma layers
[TRITA-EPP-80-12] N81-31735
Synchronization: A formal approach N81-31871

SIMULATORS
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633

SINGLE CRYSTALS
Growth of beryllium monocrystals for neutron monochromators N81-31260
Recoilless Rayleigh scattering from pure single crystals of Barium titanate near the 130 deg C ferroelectric Curie point N81-32051

SINGULARITY (MATHEMATICS)
Quantum conformal fluctuations near the classical space-time singularity
[PREPRINT-64] N81-32071

SINTERING
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366

SITE SELECTION
A dynamic model of the urban process
[PB81-196990] N81-31694
Cost effective stream and effluent monitoring
[PB81-202210] N81-31701
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791

SKIN (ANATOMY)
Comparison between the heat loss and heat gain through the lungs and body surface during hypothermia and its treatment
[DRIC-T-6307] N81-31825

SOCIAL FACTORS
Modeling energy and society: Theory and method in assessing the social effects of energy policies. Volume 1: Executive summary
[DOE/TIC-1022359] N81-31646
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 2: Social meanings of energy
[DOE/TIC-1022360] N81-31647
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 3: The measurement model
[DOE/TIC-1022361] N81-31648
Epidemiological basis for the prevention of coronary heart disease N81-31835

SOCIOLOGY
Modeling energy and society: Theory and method in assessing the social effects of energy policies. Volume 1: Executive summary
[DOE/TIC-1022359] N81-31646
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 2: Social meanings of energy
[DOE/TIC-1022360] N81-31647
Modelling energy and society: Theory and method in assessing the social effects of energy policies. Volume 3: The measurement model
[DOE/TIC-1022361] N81-31648

SODIUM CHLORIDES
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339

SODIUM COMPOUNDS
Salt-hydrate thermal-energy-storage system for space heating and air conditioning
[DOE/CS-34698/T1] N81-31669

SOIL MOISTURE
Analytical models for simultaneous heat and moisture transport in soils
[RHO-LD-49] N81-31519

SOIL SCIENCE
Analytical models for simultaneous heat and moisture transport in soils
[RHO-LD-49] N81-31519

SOILS
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595

SOLAR ACTIVITY
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
Hydro-climatic variability in the equatorial Atlantic Correlation with solar activity N81-31756
On the possible effect of long-lasting absence of solar activity on climatic changes N81-31764
Solar activity and variations of meteorological parameters --- climate N81-31765
Structural variability of the Sun --- radius and luminosity N81-31770
Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771
Beryllium-10 as a potential probe of solar variability influence on climate N81-31772
Study of geomagnetic storms, solar flares, and centers of activity in 1977
[AD-A102301] N81-32109
Solar-geophysical data number 437, January 1981. Part 1: (Prompt Reports) data for December 1980, November 1980 and late data
[PB81-198087] N81-32111
Solar-geophysical data number 437, January 1981. Part 2: (Comprehensive Reports) Data for July 1980 and miscellanea
[PB81-198095] N81-32112

SOLAR ATMOSPHERE
The solar neutrino problem --- solar models N81-31768
Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108

SOLAR ATRIUMS
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659

SOLAR CELLS
Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623
Low-cost epitaxial techniques for solar-cell fabrication
[SERI/TR-8274-1-T1] N81-31650

SOLAR COLLECTORS
Storage in residential solar total-energy systems
[BNL-51230] N81-31658
Second-generation heliostat detail design report
[SAND-78-8192] N81-31663
Commercialization of a photovoltaic concentrator: Acurex report
[SAND-80-7082] N81-31665
Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668

SOLAR CONSTANT
Long term variations of the solar constant --- solar models N81-31767
Working group 3: Space measurements --- solar constant, experiments N81-31780
Application of radiation pressure measurements to the monitoring of the solar constant --- satellite borne accelerometer N81-31782

SOLAR COOLING
Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 2
[NASA-CR-161841] N81-31634
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659

SOLAR CORONA
Effects of the solar magnetic field on the semiannual intensity of the green coronal line N81-31758
Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations
[LA-UR-81-1247] N81-32110

SOLAR CORPUSCULAR RADIATION
Variable corpuscular and electromagnetic emissions from the Sun N81-31751

SOLAR CYCLES
Solar cycle and solar terrestrial relationships --- to weather N81-31752
Temperature variability and the 22 year solar cycle N81-31753
Rainfall patterns in South Africa, southeastern Australia and New Zealand N81-31754
Power spectra of the climatological variations in Mexico City --- solar terrestrial interactions N81-31755

The 200, 22 and 11 year cycles and long series of climatic data, mainly since 200 AD --- atmospheric pressure N81-31757

Role of solar and non-solar sources in changing global climate in the past several hundred years N81-31759

The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin --- pressure variations, magnetic storms N81-31760

Quasi-biennal oscillation of solar activity and its control of the Earth's climate --- solar neutrinos N81-31761

On the possible effect of long-lasting absence of solar activity on climatic changes N81-31764

Eleven-year solar cycle influence on atmospheric exchanges in the Antarctica --- lead isotopes in aerosols N81-31766

Working group 2: Physical mechanisms N81-31779

A review of observational evidence for short and long term ultraviolet flux variability of the Sun N81-31783

The solar spectral irradiance 1200-3184 a near solar maximum, 15 July 1980
[NASA-CR-164727] N81-32107

SOLAR ECLIPSES

Dynamics of the atmospheric boundary layer during the 1980 total solar eclipse
[BNL-29497] N81-31729

SOLAR ENERGY

Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625

Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640

Solar energy model Goennebek. Development and planning of a self-supporting heating plant for greenhouses
[BMFT-FB-T-80-119] N81-31673

Transfer of information from researcher to consumer: Choosing the appropriate media
[SERI/TP-513-1193] N81-32077

Highlights of NASA/DOE photovoltaics market assessment visit to Colombia
[NASA-TM-84011] N81-32081

SOLAR ENERGY CONVERSION

Florida's renewable energy potential
[GPO-68-757] N81-31637

Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653

SOLAR FLARES

Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108

SOLAR FLUX DENSITY

Solar luminosity variation on directly observable time scales: observational evidence and basic mechanisms N81-31769

A review of observational evidence for short and long term ultraviolet flux variability of the Sun N81-31783

SOLAR GENERATORS

Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant
[SAND-80-8190] N81-31657

Solar power tower design guide: Solar thermal central receiver power systems. A source of electricity and/or process heat
[SAND-81-8005] N81-31670

SOLAR HEATING

Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625

Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 1
[NASA-CR-161841] N81-31634

Solar space- and water-heating system at Stanford University Central Food Services Building
[DOE/CS-31522/T2] N81-31655

Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659

Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666

Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668

SOLAR HOUSES

Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description
[SOLAR/1022-81/50] N81-31666

SOLAR INSTRUMENTS

Second-generation heliostat detail design report
[SAND-78-8192] N81-31663

SOLAR MAGNETIC FIELD

Effects of the solar magnetic field on the semiannual intensity of the green coronal line N81-31758

SOLAR MESOSPHERE EXPLORER

Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239

SOLAR NEUTRINOS

Quasi-biennal oscillation of solar activity and its control of the Earth's climate --- solar neutrinos N81-31761

The solar neutrino problem --- solar models N81-31768

SOLAR POWER SATELLITES

Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732

SOLAR PROMINENCES

Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108

SOLAR RADIATION

A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774

SOLAR RADIO EMISSION

Solar-geophysical data number 437, January 1981. Part 1: (Prompt Reports) data for December 1980, November 1980 and late data
[PB81-198087] N81-32111

Solar-geophysical data number 437, January 1981. Part 2: (Comprehensive Reports) Data for July 1980 and miscellanea
[PB81-198095] N81-32112

SOLAR REFLECTORS

Solar central receiver heliostat mirror module development
[SAND-79-8189] N81-31656

SOLAR ROTATION

Possible influence of solar rotation on tropospheric circulation N81-31762

SOLAR SENSORS

Study of an attitude acquisition measurement technique using the ESA starmapper. Part 1: Executive summary --- computerized simulation
[NLR-TR-79116-U-PT-1] N81-31279

Study of an attitude acquisition measurement technique using the ESA starmapper, part 2
[NLR-TR-79116-U-PT-2] N81-31280

SOLAR SPECTRA

The solar spectral irradiance 1200-3184 a near solar maximum, 15 July 1980
[NASA-CR-164727] N81-32107

SOLAR SPECTROMETERS

An instrument to measure the solar spectrum from 170 to 3200 mm on board Spacelab N81-31781

SOLAR TERRESTRIAL INTERACTIONS

Sun and Climate --- conferences N81-31749

Solar cycle and solar terrestrial relationships --- to weather N81-31752

Role of solar and non-solar sources in changing global climate in the past several hundred years N81-31759

The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin --- pressure variations, magnetic storms N81-31760

Possible influence of solar rotation on tropospheric circulation N81-31762

The magnetosphere, interface between the Sun and the lower atmosphere N81-31763

On the possible effect of long-lasting absence of solar activity on climatic changes N81-31764

Fluctuations, solar periodicities, and climatic transitions --- climate modeling N81-31777

Working group 2: Physical mechanisms N81-31779

Working group 3: Space measurements --- solar constant, experiments N81-31780

Solar-geophysical data number 437, January 1981. Part 1: (Prompt Reports) data for December 1980, November 1980 and late data
[PB81-198087] N81-32111

Solar-geophysical data number 437, January 1981. Part 2: (Comprehensive Reports) Data for July 1980 and miscellanea
[PB81-198095] N81-32112

SOLAR TOTAL ENERGY SYSTEMS

Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625

Storage in residential solar total-energy systems
[BNL-51230] N81-31658

SOLID PROPELLANT ROCKET ENGINES

Solid rocket booster thrust vector control V-2 off-nominal testing
[NASA-TM-82439] N81-31283

SOLID SOLUTIONS

Hydrogen in metals N81-31335

SOLID STATE DEVICES

Hamilton Standard Superjet solid state fluidic rate sensor N81-31176

SOLID WASTES

Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636

SOLIDIFICATION

Trapping of discrete phases at solidification fronts --- space experiment supporting theory N81-31252

Concentration profiles in front of solidification fronts --- crystal growth N81-31254

SOLIDS

Exact finite elements for conduction and convection
[NASA-CR-164723] N81-31507

SOLITARY WAVES

On solitary kinetic Alfven waves in a magnetized plasma N81-32025

SOLSTICES

Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805

SOLUBILITY

Measurement of thermodynamic quantities of polymer systems --- characterizing the miscibility
[MS-1240] N81-31377

Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501

CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645

SOOT

Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319

SORPTION

Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537

SOS (SEMICONDUCTORS)

Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32065

SOUND AMPLIFICATION

Sidetone-level considerations in aircraft communication systems N81-31475

SOUND GENERATORS

Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633

SOUND TRANSMISSION

Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411

SOUND WAVES

Acoustic radiation and diffraction from convex and concave domes
[AD-A102295] N81-31958

SOUTH AMERICA

Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805

SOVIET SPACECRAFT
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
SOYBEANS
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614
SPACE COOLING (BUILDINGS)
Nonresidential building energy consumption survey
[DOE/EIA-0288] N81-31642
Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653
SPACE FLIGHT
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
SPACE FLIGHT STRESS
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810
SPACE HEATING (BUILDINGS)
Nonresidential building energy consumption survey
[DOE/EIA-0288] N81-31642
Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653
Solar space- and water-heating system at Stanford University. Central Food Services Building
[DOE/CS-31522/T2] N81-31655
Salt-hydrate thermal-energy-storage system for space heating and air conditioning
[DOE/CS-34698/T1] N81-31669
SPACE MANUFACTURING
Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630
SPACE PLASMAS
Electric fields in Earth orbital space
[AD-A102550] N81-32101
SPACE POWER UNIT REACTORS
Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630
SPACE PROCESSING
Spacelab utilization: Materials research and processing technology in space --- conferences
[DGLR-80-02] N81-31241
Current problems in the German program on materials research and processing technology in space N81-31242
Projects and plans of the German program on materials research and processing technology in space N81-31243
Performing experiments under space flight conditions in the domain of chemical engineering N81-31245
Multiple purpose facilities for materials science experiments in space N81-31251
Trapping of discrete phases at solidification fronts --- space experiment supporting theory N81-31252
Growth of beryllium monocrystals for neutron monochromators N81-31260
Process chamber: Heat conduction, diffusion, convection, reaction kinetics, surfaces and wettability under reduced gravity N81-31262
Convection in a floating zone without rotation --- on Earth and under reduced gravity N81-31263
Marangoni convection in a rotating melting zone N81-31264
Reaction kinetics in molten glasses N81-31265
SPACE PROGRAMS
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
SPACE SHUTTLE BOOSTERS
Solid rocket booster thrust vector control V-2 off-nominal testing
[NASA-TM-82439] N81-31283
SPACE SHUTTLE ORBITERS
Space Shuttle news reference
[NASA-TM-82290] N81-31276
SPACE SHUTTLES
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277
Tension-tension fatigue behavior of the Space Shuttle strain-isolation-pad material
[NASA-TM-83183] N81-31577
SPACE TRANSPORTATION SYSTEM
Space Shuttle news reference
[NASA-TM-82290] N81-31276
SPACE TRANSPORTATION SYSTEM 1 FLIGHT
Atmospheric environment for space shuttle (STS-1) launch
[NASA-TM-82436] N81-31743
SPACE-TIME FUNCTIONS
Quantum conformal fluctuations near the classical space-time singularity
[PREPRINT-64] N81-32071
SPACEBORNE EXPERIMENTS
Spacelab utilization: Materials research and processing technology in space --- conferences
[DGLR-80-02] N81-31241
Current problems in the German program on materials research and processing technology in space N81-31242
Projects and plans of the German program on materials research and processing technology in space N81-31243
Space life sciences --- definition - experiment proposals N81-31244
Performing experiments under space flight conditions in the domain of chemical engineering N81-31245
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250
Multiple purpose facilities for materials science experiments in space N81-31251
Construction and test of a mono-ellipsoid mirror heating facility --- for crystal growth experiments during space flight N81-31258
Process chamber: Heat conduction, diffusion, convection, reaction kinetics, surfaces and wettability under reduced gravity N81-31262
Optics workshop: View of the applications of the Space Optics Laboratory, Aug. 1979 --- conferences, Aug. 1979
[BMFT-FB-W-79-44] N81-31993
The Space Optics Laboratory --- concept and realization N81-31996
Application of the Space Optics Laboratory in the specific case of Benard cell convection N81-31997
Modes of operation of the Space Optics Laboratory N81-31998
Interface convection under microgravity conditions N81-31999
Space experiments on dissipative structures N81-32005
Storage of fluids and fuels in large tanks under zero gravity N81-32007
Voyager backgrounder
[NASA-NEWS-RELEASE-81-116] N81-32102
SPACEBORNE TELESCOPES
Structural design of a large deformable primary mirror for a space telescope N81-31984
Design of a spaceborne lightning sensor N81-31987
Space Telescope digicon technology
[NASA-CR-166704] N81-32096
SPACECRAFT CHARGING
Development and design of three monitoring instruments for spacecraft charging
[NASA-TP-1800] N81-31282
SPACECRAFT COMMUNICATION
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems --- microwave attenuation
[FUB-49-1980] N81-31445
SPACECRAFT COMPONENTS
Voyager backgrounder
[NASA-NEWS-RELEASE-81-116] N81-32102
SPACECRAFT CONFIGURATIONS
Voyager backgrounder
[NASA-NEWS-RELEASE-81-116] N81-32102
SPACECRAFT DESIGN
High Reynolds number research requirements for space vehicle design N81-31151
Space Shuttle news reference
[NASA-TM-82290] N81-31276
SPACECRAFT ELECTRONIC EQUIPMENT
The APL satellite refrigerator program
[AD-A102377] N81-31274
SPACECRAFT INSTRUMENTS
The Cactus accelerometer N81-31177
SPACECRAFT LAUNCHING
Mission operation report: Solar Mesosphere Explorer (SME)
[NASA-TM-84013] N81-31239
Atmospheric environment for space shuttle (STS-1) launch
[NASA-TM-82436] N81-31743
SPACECRAFT POWER SUPPLIES
Characterization of the physico-chemical properties of polymeric materials for aerospace flight --- nickel cadmium batteries
[NASA-CR-160070] N81-31362
The 50 AMP-hour nickel cadmium battery manual
[NASA-CR-166701] N81-31626
SPACELAB PAYLOADS
Spacelab utilization: Materials research and processing technology in space --- conferences
[DGLR-80-02] N81-31241
Development of a matter exchanger --- for spaceflight experiment and usage N81-31250
Biochemical preparatory and analytical developments and plans in connection with the Spacelab programs --- protein crystal growth N81-31261
An instrument to measure the solar spectrum from 170 to 3200 mm on board Spacelab N81-31781
Optics workshop: View of the applications of the Space Optics Laboratory, Aug. 1979 --- conferences, Aug. 1979
[BMFT-FB-W-79-44] N81-31993
The Space Optics Laboratory --- concept and realization N81-31996
Modes of operation of the Space Optics Laboratory N81-31998
SPALLING
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
[NASA-TP-1899] N81-31366
SPARE PARTS
An introduction to a reliability shorthand
[AD-A102372] N81-31558
SPARK IGNITION
Review of alternate automotive engine fuel economy
[PB81-186652] N81-31555
SPATIAL DISTRIBUTION
Flight simulator: Use of spacegraph display in an instructor/operator station
[AD-A101951] N81-31235
SPECIFICATIONS
Transformational implementation: An example
[AD-A101994] N81-31891
SPECTRA
An adaptive ARMA spectral estimator, part 1
[AD-A101869] N81-31927
SPECTRAL EMISSION
Spectral emissivity at high temperatures
[AD-A101949] N81-31311
SPECTRAL ENERGY DISTRIBUTION
Statistical study of precipitating electrons
[NASA-TM-80458] N81-31718
SPECTRAL REFLECTANCE
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595
An instrument to measure the solar spectrum from 170 to 3200 mm on board Spacelab N81-31781
SPECTRAL RESOLUTION
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099
SPECTRAL SIGNATURES
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598
SPECTROMETERS
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
SPECTROPHOTOMETRY
A spectrophotometric study of H 2 regions in chemically young galaxies N81-32093
Spectrophotometry of galactic supernova remnants N81-32094
SPECTROSCOPY
Fluorescent probes in the solid state and their application to inorganic ion determinations N81-31305

SPECTRUM ANALYSIS
Methane spectral analysis
[AD-A102300] N81-31316
Journal of research of the National Bureau of Standards, volume 86, number 1
[PB81-196198] N81-31327
Digital spectral analysis: A guide based on experience with aircraft vibration
[RAE-TR-81014] N81-31588
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595
Statistical study of precipitating electrons
[NASA-TM-80458] N81-31718
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along lattitude 50 N for summer and winter, series A monographs --- including geostrophic winds
[ISSN-0342-4324] N81-31741
SPEECH
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
Some applications of the STI-method in evaluating speech transmission channels N81-31466
Integrating local information to understand dialog N81-31879
SPEECH RECOGNITION
Investigation of parameters affecting voice recognition systems in C3 Systems
[AD-A102371] N81-31426
A longitudinal study of computer voice recognition performance and vocabulary size
[AD-A102208] N81-31427
Recognition test for an open set of talkers represented by their acoustic parameters
[FUB-2-1981] N81-31446
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453
The effect of noise-induced hearing loss on the intelligibility of speech in noise N81-31460
STI: An objective measure for the performance of voice communication systems N81-31465
Sidetone-level considerations in aircraft communication systems N81-31475
SPHERES
Mass, heat and momentum transfer to a sphere in a rarefied gas --- aerosols N81-31506
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies
[NMI-R-71] N81-31522
SPHEROMAKS
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030
SPIN RESONANCE
Electron spin resonance in amorphous alloys N81-32057
SPIN STABILIZATION
Study of an attitude acquisition measurement technique using the ESA starmapper, part 2
[NLR-TR-79116-U-PT-2] N81-31280
Limits of studying high-spin states by discrete-line Gamma-ray spectroscopy
[CONF-8006160-1] N81-31321
SPRAYED COATINGS
Automated Plasma Spray (APS) process feasibility study
[NASA-CR-165418] N81-31193
SPREAD F
Nonlinear equatorial spread F: The effect of neutral winds and background Pedersen conductivity
[AD-A102555] N81-31278
SPUTTERING
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287
DC sputter gold deposition on beryllium-copper contacts
[BDX-613-2629] N81-31348
STABILITY
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952
Stability characteristics of epoxy-impregnated superconducting magnets
[AD-A102419] N81-31953
STABILITY DERIVATIVES
Dynamic Stability Parameters --- conferences
[AGARD-LS-114] N81-31105
Review of techniques for determination of dynamic stability parameters in wind tunnels N81-31108
Direct forced-oscillation techniques for the determination of stability derivatives in wind tunnels N81-31109
Wind-tunnel measurement of aerodynamic derivatives using flexible-sting rigs N81-31110
Curved-flow, rolling-flow, and oscillatory pure-yawing wind-tunnel test methods for determination of dynamic stability derivatives N81-31112
Applications of half-model technique in dynamic stability testing N81-31114
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
Estimation of dynamic stability parameters from drop model flight tests N81-31116
Analytical determination of dynamic stability parameters N81-31117
Aeroelasticity, including dynamic effects of separated flow --- launch vehicle response N81-31118
Control derivatives N81-31119
Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120
Applications of dynamic stability parametes to problems in aircraft dynamics N81-31122
STABILITY TESTS
Optimization of accelerated stability-test techniques for diesel fuels
[DOE/BC-10043/25] N81-31392
STABILIZATION
Impact of high-alpha aerodynamics on dynamic stability parameters of aircraft and missiles N81-31107
STABILIZERS (AGENTS)
Microstructure and mechanical properties of bulk yttria-partially-stabilized zirconia
[NASA-CR-165402] N81-31340
STACKS
Design and assembly considerations for Redox cells and stacks
[NASA-TM-82672] N81-31308
STAINLESS STEELS
Delayed failure characteristics of plasma-sprayed aluminum oxide applied to stainless steel and titanium alloy substrates in various physiological media N81-31332
The separate roles of forest dislocations and subgrains in the isotropic hardening of type 304 stainless steel N81-31334
Corrosion and stress corrosion cracking of type 304 stainless steel and carbon steel in simulated boiling water reactor N81-31336
STANDARDS
Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180
Journal of research of the National Bureau of Standards, volume 86, number 1
[PB81-196198] N81-31327
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459
Hearing standards for aircrew N81-31461
Hearing conservation N81-31472
STAR TRACKERS
Study of an attitude acquisition measurement technique using the ESA starmapper. Part 1: Executive summary --- computerized simulation
[NLR-TR-79116-U-PT-1] N81-31279
Study of an attitude acquisition measurement technique using the ESA starmapper, part 2
[NLR-TR-79116-U-PT-2] N81-31280
STATIC TESTS
Ductile fracture toughness determined on an energy basis using polycarbonate N81-31563
STATISTICAL ANALYSIS
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980
[AD-A102495] N81-31187
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236
Statistical constraints on scalar variables in turbulent flows
[AD-A102342] N81-31515
Working group 1: Statistical methods --- experimental design, data correlation N81-31778
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817
Modal noise in optical fibers --- statistical analysis, propagation modes N81-32011
Dynamometer and track measurement of passenger car fuel economy
[PB81-196446] N81-32092
STATISTICAL CORRELATION
Rainfall patterns in South Africa, southeastern Australia and New Zealand N81-31754
Generalized Blomqvist correlation --- detecting edges in computer image processing
[AD-A102058] N81-31939
STATISTICAL DISTRIBUTIONS
Some aspects of fluctuating vertical wind shears
[PNL-3771] N81-31792
On an estimation scheme for Gauss Markov random field models --- image processing
[AD-A102057] N81-31938
Characterizations and goodness of fit tests
[AD-A102167] N81-31943
The first four moments of a distribution --- properties of estimations; testing for normality
[IWIS-TNO-A-79-ST-66-36] N81-31951
STATISTICAL MECHANICS
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070
STATISTICAL TESTS
Order restricted statistical tests on multinomial and Poisson parameters: The starshaped restriction
[AD-A102562] N81-31936
Estimation in latent trait models
[AD-A102216] N81-31937
Generalized Blomqvist correlation --- detecting edges in computer image processing
[AD-A102058] N81-31939
Characterizations and goodness of fit tests
[AD-A102167] N81-31943
Tests for standardized generalized variances of multivariate normal populations of possibly different dimensions
[AD-A102021] N81-31948
STATOR BLADES
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity
[NASA-TM-82690] N81-31956
STDN (NETWORK)
Prototype microprocessor controller --- for STDN antennas
[NASA-CR-166703] N81-31861
STEADY FLOW
Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138
Onset of condensation effects in cryogenic wind tunnels N81-31139
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Far field conditions in steady flows with a free stream Mach number one
[AD-A102174] N81-31155
STEADY STATE
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
STEELS
Blast-resistant capacities of cold-formed steel panels
[AD-A101915] N81-31343
Combined macroscopic and microscopic approach to the fracture of metals
[DOE/ER-10556/85] N81-31346
STELLAR EVOLUTION
Accreting white dwarf models for type 1 supernovae. 1: Presupernova evolution and triggering mechanisms
[NASA-TM-83810] N81-32100

STELLAR MAGNETIC FIELDS
Effects of magnetic fields on main sequence stars N81-32098
STELLAR STRUCTURE
Effects of magnetic fields on main sequence stars N81-32098
STEREOSCOPIC VISION
Perception of spatial features with stereoscopic displays
[AD-A102156] N81-31436
STEREOTELEVISION
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound
[BBC-RD-1981/3] N81-31411
STIFFNESS
Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582
STIRLING CYCLE
High-power baseline and motoring test results for the GPU-3 Stirling engine
[NASA-TM-82646] N81-32087
STOCHASTIC PROCESSES
Finite-sum expressions for signal detection probabilities
[AD-A102143] N81-31433
Multi-server queues
[AD-A101851] N81-31906
Basic research in digital stochastic model algorithmic control
[AD-A102145] N81-31909
Problems in optimal filtering and stochastic control
[AD-A102478] N81-31929
Large deviation probabilities for certain dependent processes
[AD-A102166] N81-31942
STONY METEORITES
The abundance and distribution of chlorine in meteorites N81-32105
STORAGE BATTERIES
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables
[AD-A102083] N81-31639
STORAGE STABILITY
Optimization of accelerated stability-test techniques for diesel fuels
[DOE/BC-10043/25] N81-31392
STORAGE TANKS
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565
STORMS (METEOROLOGY)
Mariners weather log, volume 24, number 6, November-December 1980
[PB81-195372] N81-31795
STRAIN HARDENING
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
Strain-hardening and rate effects in plasticity N81-31569
STRAIN RATE
Strain-hardening and rate effects in plasticity N81-31569
STRAPDOWN INERTIAL GUIDANCE
Identification and determination of strapdown error-parameters by laboratory testing N81-31179
STRATOSPHERE
A study of stratospheric discharges
[AD-A102284] N81-31726
STRATOSPHERE RADIATION
Meteorological data. Volume 2, number 2: Synoptic stratopause method for computation of temperature profiles from satellite measurements of the infrared radiation during winter warmings, series A monographs
[ISSN-0342-4324] N81-31740
STREAMS
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
Cost effective stream and effluent monitoring
[PB81-202210] N81-31701
STRESS ANALYSIS
Unsteady thermal stress analysis of a cryogenic foam insulation element
[DFVLR-FB-81-17] N81-31378
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
Nondestructive evaluation of path-independent integrals in fracture mechanics N81-31570
Acoustoelastic measurement of residual stresses N81-31571
STRESS CONCENTRATION
Ductile fracture toughness determined on an energy basis using polycarbonate N81-31563
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
Development of an orthotropic hole element
[NASA-CR-165759] N81-31580
STRESS CORROSION CRACKING
Corrosion and stress corrosion cracking of type 304 stainless steel and carbon steel in simulated boiling water reactor N81-31336
STRESS INTENSITY FACTORS
Stress-intensity factor equations for cracks in three-dimensional finite bodies
[NASA-TM-83200] N81-31578
STRESSES
Stress-assisted diffusion and consolidation with double porosity N81-31561
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
STRINGERS
Universal connectors for joining stringers
[NASA-CASE-LAR-12744-1] N81-31551
STRONG INTERACTIONS (FIELD THEORY)
Hyperpions at the Z(0)
[DOE/ER-01545/306] N81-31968
STRUCTURAL ANALYSIS
Structures performance, benefit, cost-study
[NASA-CR-165456] N81-31194
Global function approach in structural analysis: Basic approach, numerical results
[NASA-CR-165669] N81-31579
Theoretical and experimental study of the behavior of reinforced plastic plates. Part 1: General theory
[CRIF-PL-14-PT-1] N81-31587
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
STRUCTURAL DESIGN
Instrumentation systems for the National Transonic Facility N81-31137
Considerations in the design of large space structures
[NASA-CR-165744] N81-31271
Interactive optimal design of dynamically loaded structures
[PB81-195679] N81-31410
Structural design of a large deformable primary mirror for a space telescope N81-31984
STRUCTURAL DESIGN CRITERIA
The nature of operating flight loads and their effect on propulsion system structures N81-31207
Considerations in the design of large space structures
[NASA-CR-165744] N81-31271
Summary and recommendations for the implementation of rigid pavement design, construction and rehabilitation techniques
[PB81-200578] N81-31409
STRUCTURAL ENGINEERING
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277
EDS coal liquefaction process development, phase 4. Construction of Exxon coal liquefaction pilot plant
[DOE/ET-10069/T4] N81-31389
STRUCTURAL MEMBERS
Universal connectors for joining stringers
[NASA-CASE-LAR-12744-1] N81-31551
STRUCTURAL PROPERTIES (GEOLOGY)
Cross-strike structural discontinuities-tear faults and transfer zones in the central Appalachians of West Virginia N81-31712
STRUCTURAL RELIABILITY
Factors of safety related to structural integrity. A review of data from military airworthiness authorities
[AGARD-R-677] N81-31186
STRUCTURAL STRAIN
Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603
The application of optical fibers for monitoring devices for the detection of plastic strain and cracking
[NMI-R-72] N81-32020
STRUCTURAL VIBRATION
Digital spectral analysis: A guide based on experience with aircraft vibration
[RAE-TR-81014] N81-31588
STRUCTURES
Abstract storage structures --- programming languages, abstract data types
[MC-IW-158/81] N81-31901
STYROFOAM (TRADEMARK)
Unsteady thermal stress analysis of a cryogenic foam insulation element
[DFVLR-FB-81-17] N81-31378
SUBMERGED BODIES
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies
[NMI-R-71] N81-31522
SUBMILLIMETER WAVES
High power submillimeter and infrared radiation from intense relativistic electron beams
[AD-A102487] N81-31541
SUBSIDENCE
Demonstration of subsidence monitoring system
[DOE/ET-10029/T1] N81-31731
SUBSONIC FLOW
Comparison of hot and cold subsonic jets in external flow with reference to jet engine simulation
[NLR-TR-80042-U] N81-31156
SUDDEN IONOSPHERIC DISTURBANCES
Solar-geophysical data number 437, January 1981. Part 1: (Prompt Reports) data for December 1980, November 1980 and late data
[PB81-198087] N81-32111
Solar-geophysical data number 437, January 1981. Part 2: (Comprehensive Reports) Data for July 1980 and miscellanea
[PB81-198095] N81-32112
SUGARS
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
SULFIDES
Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer
[AD-A102290] N81-31367
SULFUR DIOXIDES
Selective extraction of metals from Pacific Sea nodules with dissolved sulfur dioxide
[PB81-197139] N81-31356
Sulfur dioxide oxidation reactions in aqueous solutions
[PB81-196834] N81-31738
SULFUR OXIDES
Controlling sulfur oxides
[PB81-200800] N81-31700
SULFURIC ACID
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988
SUMMER
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along latitude 50 N for summer and winter, series A monographs --- including geostrophic winds
[ISSN-0342-4324] N81-31741
SUNGLASSES
Eye protection and tinted lenses N81-31852
SUNSPOTS
Solar cycle and solar terrestrial relationships --- to weather N81-31752
SUPERCONDUCTING MAGNETS
Stability characteristics of epoxy-impregnated superconducting magnets
[AD-A102419] N81-31953
SUPERCONDUCTIVITY
Layered superconducting composites N81-32044
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047
SUPERCONDUCTORS
Layered superconducting composites N81-32044
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047
Theory of quasiparticle tunneling between dissimilar superconductors N81-32050

SUPERHIGH FREQUENCIES
Space diversity experiments on a 20 kilometer long 15 GHz link --- reduction of mutipath fading
[REPT-455-TBR-70] N81-31442
SUPERNOVA REMNANTS
Spectrophotometry of galactic supernova remnants N81-32094
The origin of the Crab Nebula and the electron capture supernova in 8-10 M solar mass stars
[NASA-TM-82179] N81-32097
SUPERNOVAE
The origin of the Crab Nebula and the electron capture supernova in 8-10 M solar mass stars
[NASA-TM-82179] N81-32097
Accreting white dwarf models for type 1 supernovae. 1: Presupernova evolution and triggering mechanisms
[NASA-TM-83810] N81-32100
SUPERPLASTICITY
Superplastic forming and diffusion bonding of CORONA 5
[AD-A102206] N81-31344
SUPERSONIC FLOW
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow
[NASA-CR-3466] N81-31127
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154
SUPPLYING
World petroleum outlook, 1981
[PUBL-97-4] N81-31608
Energy modeling. Volume 2: Inventory and details of state energy models
[DOE/CS-10046/2-VOL-2] N81-31661
District heating: Air-quality considerations and the Clean Air Act
[BNL-51361] N81-31683
SUPPORT INTERFERENCE
Support interference N81-31113
SUPPRESSORS
Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428
SURFACE CRACKS
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590
SURFACE FINISHING
DC sputter gold deposition on beryllium-copper contacts
[BDX-613-2629] N81-31348
Progress in the battle with the burr
[BDX-613-2306] N81-31552
Ultraprecision machining of optics at Los Alamos
[LA-UR-81-1962] N81-32018
SURFACE NAVIGATION
Ocean services for the nation. National ocean goals and objectives for the 1980's
[PB81-200602] N81-31808
SURFACE PROPERTIES
Moment method solutions for radiation and scattering from arbitrarily shaped surfaces N81-31416
Electrochemical deburring
[BDX-613-2594] N81-31553
Digitally-controlled adaptive welding system
[PB81-183907] N81-31556
An LCAO local density functional approach to surface electronic structure calculations --- thin films N81-32048
Electronic structure of solids and their surfaces and interfaces
[AD-A101945] N81-32062
SURFACE REACTIONS
Photochemistry of surface-confined organometallics: Photochemical release of a surface-confined cobalt carbonyl catalyst
[AD-A102112] N81-31317
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503
SURFACE ROUGHNESS
Preliminary experimental study of disturbances in a laminar boundary-layer due to distributed surface roughness
[AD-A102072] N81-31513
Turbulent boundary layer flow through a gap in a wall-mounted roughness element
[AD-A102324] N81-31516
SURFACE ROUGHNESS EFFECTS
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites
[RAE-TR-75144] N81-31297
SURFACE TEMPERATURE
Satellite identification of surface radiant temperature fields of subpixel resolution
[PB81-184038] N81-31615
SURFACE WATER
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
Water resources data for Maryland and Delaware, water year 1980
[PB81-195885] N81-31616
SURFACE WAVES
Plane-strain surface waves in a laminated composite
[AD-A102087] N81-31440
Analysis of local variations in free field seismic ground motion N81-31709
Analysis and computer studies for magnetostatic surface wave transducers
[AD-A102207] N81-31954
SURVIVAL
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820
SUSPENDING (MIXING)
Trapping of discrete phases at solidification fronts --- space experiment supporting theory N81-31252
SUSPENSION SYSTEMS (VEHICLES)
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549
SWAGING
An investigation of assembly and performance of a Resistoflex dynatube 1/4 inch fitting
[NASA-TM-82429] N81-31402
SWEDEN
Estimated contributions of Swedish and outside sources to background aerosol concentrations in Sweden
[CM-50] N81-31688
SWITCHES
The use of inductive position switches in personnel safety systems
[FOA-C-30166-E5] N81-31170
SWITCHING
Power transistor switching characterization
[NASA-CR-164607] N81-31497
SYNCHRONISM
Synchronization: A formal approach N81-31871
SYNCHROTRON RADIATION
Simple fast routine for computation of energy transport by synchroton radiation in Tokamaks and similar geometries
[SAI-023-81-189-LJ] N81-32040
Profile effects of synchrotron radiation in deuterium-fueled Tokamaks
[SAI-023-81-215-LJ] N81-32041
SYNOPTIC METEOROLOGY
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745
SYNTAX
A longitudinal study of computer voice recognition performance and vocabulary size
[AD-A102208] N81-31427
Analyzing a syntactic family of complexity metrics --- quantifying the complexity of computer programs
[AD-A101920] N81-31890
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904
SYNTHESIS (CHEMISTRY)
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases
[DOE/ET-14809/6] N81-31322
Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359
Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer
[AD-A102290] N81-31367
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396
SYNTHETIC FUELS
Synthetic fuel oversight hearing
[GPO-76-079] N81-31382
Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385
A United Kingdom view on future fuels
[PNR-90068] N81-31398
SYSTEM EFFECTIVENESS
Active beacon collision avoidance logic evaluation. Volume 1: Mode C equipped (ATCRBS) threat phase
[AD-A102163] N81-31181
Assessing the effectiveness of auditory warnings N81-31457
SYSTEM GENERATED ELECTROMAGNETIC PULSES
Development and design of three monitoring instruments for spacecraft charging
[NASA-TP-1800] N81-31282
SYSTEMS ANALYSIS
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system
[AD-A102320] N81-31268
High resolution angular sensor --- reducing ring laser gyro output quantization using phase locked loops
[NASA-CR-161843] N81-31528
Second-generation heliostat detail design report
[SAND-78-8192] N81-31663
Abstract storage structures --- programming languages, abstract data types
[MC-IW-158/81] N81-31901
SYSTEMS ENGINEERING
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
Ocean thermal energy conversion power system development-2, phase 2
[DOE/ET-21056/T3] N81-31651
TOMS Near Realtime System design document
[NASA-TM-82170] N81-31720
Thermal infrared array, phase 1. Volume 1: Technical
[NASA-CR-166705] N81-31991
SYSTEMS MANAGEMENT
Design of the CSIN (Chemical Substances Information Network) User Services Office
[PB81-196362] N81-32080
SYSTEMS STABILITY
Application to missile dynamics N81-31123
SYSTOLE
The application of cardiograms in the valuation of navigation personnel N81-31830
SYSTOLIC PRESSURE
The application of cardiograms in the valuation of navigation personnel N81-31830

T

TABLES (DATA)
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805
TANK GEOMETRY
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565
TAPERED COLUMNS
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549
TARGET ACQUISITION
Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428
A regression analysis model with some transformations of the variables involved --- application to impact prediction
[FOA-C-20332-D8] N81-31917
TARGETS
Effects of missile and target acceleration parameters on time-to-go estimation
[AD-A102091] N81-31273
TECHNOLOGICAL FORECASTING
Neutral-beam injectors for 1990 and 2005
[UCRL-53112] N81-31978
TECHNOLOGY ASSESSMENT
Vehicle concepts and technology requirements for buoyant heavy-lift systems
[NASA-TP-1921] N81-31185

Technology assessment of automotive applications of metal-plastic laminates, volume 1
[PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2
[PB81-191090] N81-31299
Reliability of ultrasonic weld interrogation methods, phase 1
[PB81-194177] N81-31560
Accommodations assessment: Spaceborne Doppler lidar wind measuring system
[NASA-TM-82435] N81-31744

TECHNOLOGY TRANSFER
Proceedings of the Symposium: Perspectives on Scientific and Technical Information
[ORNL-5749] N81-32076
Transfer of information from researcher to consumer: Choosing the appropriate media
[SERI/TP-513-1193] N81-32077
NASA Tech Briefs Index, 1980, vol. 5 nos. 1-4 --- bibliography
[NASA-SP-5021(22)] N81-32085

TECHNOLOGY UTILIZATION
Facility management of computer-aided Design, Drafting/Manufacturing systems (CADD/M)
[UCRL-84959] N81-31895
Space Benefits: The secondary application of aerospace technology in other sectors of the economy
[NASA-CR-164733] N81-32086

TECTONICS
Deterministic methods of seismic source identification
[AD-A102333] N81-31723
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733

TELECOMMUNICATION
Packet communication in delta and related networks N81-31417
Communications research and development
[GPO-66-114] N81-31422
Design and implementation of project 7140 wideband HF communication test facility
[AD-A102261] N81-31424
The role of an electromagnetic environment model in spectrum management
[PB81-194672] N81-31448

TELEMETRY
SCRIBE 1 data analysis
[AD-A102262] N81-31315

TELESCOPES
Proton-induced noise in digicons
[NASA-TP-1852] N81-31281

TEMPERATURE CONTROL
Development of silane-hydrolysate binder for UV-resistant thermal control coatings
[NASA-TP-1900] N81-31365

TEMPERATURE DEPENDENCE
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017

TEMPERATURE DISTRIBUTION
Satellite identification of surface radiant temperature fields of subpixel resolution
[PB81-184038] N81-31615

TEMPERATURE EFFECTS
Aging characteristics of the SA1773 ceramic capacitor
[SAND-80-1132] N81-31374
Long-term creep of Hanford concrete at 250 deg F and 350 deg F
[RHO-C-50] N81-31405
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056

TEMPERATURE MEASUREMENT
Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138

TEMPERATURE PROFILES
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501
Meteorological data. Volume 2, number 2: Synoptic stratopause method for computation of temperature profiles from satellite measurements of the infrared radiation during winter warmings. series A monographs
[ISSN-0342-4324] N81-31740
Profile effects of synchrotron radiation in deuterium-fueled Tokamaks
[SAI-023-81-215-LJ] N81-32041

TEMPORAL RESOLUTION
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts
[PB81-198293] N81-31797

TENSILE PROPERTIES
Factors affecting graphite morphology, matrix structure and tensile properties of compacted graphite cast irons N81-31331

TENSILE STRENGTH
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590

TENSILE STRESS
Tension-tension fatigue behavior of the Space Shuttle strain-isolation-pad material
[NASA-TM-83183] N81-31577

TERRAIN ANALYSIS
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604

TESSERAL HARMONICS
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267

TEXAS
Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
Evaluation of Texas Air Control Board management and operations systems requirements. Part 1: Identification of TACB, phase 1
[PB81-180945] N81-32078
Evaluation of Texas Air Control Board management and operations systems requirements. Part 2: Appendices to the part 1 report, phase 2
[PB81-180952] N81-32079

TEXTURES
Edge-based texture measures
[AD-A102060] N81-31908

TF-34 ENGINE
A-10/TF34 Turbine Engine Monitoring System (TEMS) N81-31211

THEOREM PROVING
On a generalized Falkner-Skan equation --- existence and uniqueness
[NLR-MP-80035-U] N81-31919

THERMAL CONDUCTIVITY
Thermal conduction in a composite circular cylinder: A new technique for thermal conductivity measurements of lunar core samples
[NASA-TM-82331] N81-31500
Analytical models for simultaneous heat and moisture transport in soils
[RHO-LD-49] N81-31519

THERMAL DECOMPOSITION
Investigation of the breakdown of carbon fiber electrical resistance of the resulting small particles
[FOA-C-20349-F9] N81-31291
Evolution of fuel nitrogen during the vacuum thermal devolatilization of coal
[DOE/ET-10744/T3] N81-31390

THERMAL DIFFUSIVITY
Thermal diffusivities of molybdenum/alumina cermets
[GEPP-TIS-472] N81-31375

THERMAL ENERGY
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611

THERMAL EXPANSION
Certain physical properties of transition metal alloys N81-31333
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576

THERMAL INSULATION
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295
Unsteady thermal stress analysis of a cryogenic foam insulation element
[DFVLR-FB-81-17] N81-31378
Effects of thermal insulation on electrical connections and outlet boxes
[PB81-197006] N81-31495

THERMAL POLLUTION
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618

THERMAL PROTECTION
Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277

THERMAL RESISTANCE
Development of silane-hydrolysate binder for UV-resistant thermal control coatings
[NASA-TP-1900] N81-31365

THERMAL SHOCK
Thermal shocking an elastic half-space with a laser pulse N81-31562

THERMAL STABILITY
Computer program for storage and retrieval of thermal-stability data for explosives
[MHSMP-81-29] N81-31395
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501

THERMAL STRESSES
The nature of operating flight loads and their effect on propulsion system structures N81-31207
Unsteady thermal stress analysis of a cryogenic foam insulation element
[DFVLR-FB-81-17] N81-31378

THERMOCHEMICAL PROPERTIES
Development and validation of reliability forecast techniques for selected thermomechanical components of gas-turbine combined-cycle plants: Guidelines for making reliability forecasts
[EPRI-AP-1848] N81-31664

THERMODYNAMIC EFFICIENCY
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results
[NASA-CR-165235] N81-31632
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668

THERMODYNAMIC PROPERTIES
Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306
Hydrogen in metals N81-31335
Thermodynamics and diffusion in polymer solutions containing associating species N81-31358
Measurement of thermodynamic quantities of polymer systems --- characterizing the miscibility
[MS-1240] N81-31377
Computer program for storage and retrieval of thermal-stability data for explosives
[MHSMP-81-29] N81-31395
Salt-hydrate thermal-energy-storage system for space heating and air conditioning
[DOE/CS-34698/T1] N81-31669
Thermodynamic and magnetic properties of Hubbard lattices N81-32049

THERMODYNAMICS
Electromagnetic theta gun and tubular projectiles
[SAND-80-1988] N81-31490
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070

THERMOELASTICITY
Analysis and design of continuously reinforced concrete pavements N81-31564

THERMONUCLEAR REACTIONS
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031

THERMOPHYSICAL PROPERTIES
Applications of multiproperty analysis in the prediction of complex-system thermophysical behavior N81-31301

THERMOPLASTIC RESINS
Graphite reinforced thermoplastic composites
[AD-A102217] N81-31292

THETA PINCH
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023

THICKNESS
Asphaltic concrete overlays of rigid and flexible pavements
[PB81-197394] N81-31407

THIN FILMS
Hydrodynamic stability of thin films N81-31505
Layered superconducting composites N81-32044
An LCAO local density functional approach to surface electronic structure calculations --- thin films N81-32048
Electrochromism in thin films of tungsten trioxide and neodymium-doped tungsten trioxide N81-32053
Growth of HgCdTe by modified molecular beam epitaxy
[AD-A102272] N81-32064
THREE DIMENSIONAL FLOW
Three-dimensional transonic flow analysis
[AD-A101944] N81-31153
Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221
THRESHOLDS
Thresholds and Q values of nuclear reactions induced by neutrons, protons, deuterons, tritons He-3 ions, alpha particles, and photons, volume 24
[UCRL-50400-VOL-24] N81-31979
THRESHOLDS (PERCEPTION)
The effect of noise-induced hearing loss on the intelligibility of speech in noise N81-31460
Hearing standards for aircrew N81-31461
THRUST LOADS
Ball bearing mechanics
[NASA-TM-81691] N81-31550
THRUST VECTOR CONTROL
Solid rocket booster thrust vector control V-2 off-nominal testing
[NASA-TM-82439] N81-31283
THUNDERSTORMS
A study of stratospheric discharges
[AD-A102284] N81-31726
THYRISTORS
Optical triggering of power thyristors
[BMFT-FB-T-80-083] N81-31493
TIDES
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805
An empirical model for tidal currents in Puget Sound, Strait of Juan de Fuca, and Southern Strait of Georgia
[PB81-197345] N81-31806
TILTMETERS
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733
TIME DEPENDENCE
Aging characteristics of the SA1773 ceramic capacitor
[SAND-80-1132] N81-31374
An instrument for determining coincidence and elapse time between independent sources of random sequential events
[NASA-CASE-LAR-12531-1] N81-31529
TIME LAG
A time lag study of the vertical motion simulator computer system
[NASA-TM-81306] N81-31228
TIME MEASUREMENT
Oscillator monitor
[EGG-1183-1802] N81-31532
TIME SERIES ANALYSIS
An adaptive ARMA spectral estimator, part 1
[AD-A101869] N81-31927
Computationally fast algorithms for ARMA spectral estimation
[AD-A102469] N81-31941
TIN ALLOYS
Development of fracture toughness measurement capability by ultrasound
[BDX-613-2625] N81-31586
TIN OXIDES
Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623
TITANIUM ALLOYS
Superplastic forming and diffusion bonding of CORONA 5
[AD-A102206] N81-31344
Development of fracture toughness measurement capability by ultrasound
[BDX-613-2625] N81-31586
TITANIUM CARBIDES
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287
TITANIUM OXIDES
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295
Structure and properties of polymers and organcsilanes absorbed onto oxidized aluminum and titanium
[AD-A102365] N81-31370
TOKAMAK DEVICES
Banana drift transport in tokamaks with ripple
[PPPL-1784] N81-32032
Modular coils: A promising toroidal-reactor-coil system
[PPPL-1796] N81-32034
Status of the Tokamak program
[ORNL/TM-7778] N81-32039
Simple fast routine for computation of energy transport by synchroton radiation in Tokamaks and similar geometries
[SAI-023-81-189-LJ] N81-32040
Profile effects of synchrotron radiation in deuterium-fueled Tokamaks
[SAI-023-81-215-LJ] N81-32041
TOPOGRAPHY
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
Ice sheet altimetry
[NASA-CR-156877] N81-31605
Determination of plumb line curvatures by astronomical and gravimetric methods
[PB81-198723] N81-31736
LAMMR world data base documentation support and demonstrations
[NASA-CR-166706] N81-32073
TORNADOES
Dispersion of radioactive pollutant in a tornadic storm
[DP-1556] N81-31687
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745
TOROIDAL PLASMAS
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023
Modular coils: A promising toroidal-reactor-coil system
[PPPL-1796] N81-32034
Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036
TOROIDS
Field reversal by rotating waves
[IPPJ-526] N81-32028
TORUSES
Field reversal by rotating waves
[IPPJ-526] N81-32028
TOXICOLOGY
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681
TRACE ELEMENTS
The effects of trace elements in nickel containing steels and alloys
[DRIC-T-6345] N81-31353
TRACKED VEHICLES
Design of a laser system for instantaneous location of a longwall shearer
[NASA-CR-161846] N81-31607
TRAILING-EDGE FLAPS
A calculation method for the viscous flow around multi-component airfoils
[NLR-TR-79097-U] N81-31523
Computation aspects and results of low-speed viscous flow about multicomponent airfoils
[NLR-MP-80034-U] N81-31526
TRAINING DEVICES
Actual versus simulated equipment for aircraft maintenance training: Cost implications of the incremental versus the unique device
[AD-A102388] N81-31104
Flight simulator: Use of spacegraph display in an instructor/operator station
[AD-A101951] N81-31235
TRAJECTORY ANALYSIS
Minimum noise impact aircraft trajectories
[NASA-CR-164719] N81-31159
TRANSDUCERS
The Cactus accelerometer N81-31177
Analysis and computer studies for magnetostatic surface wave transducers
[AD-A102207] N81-31954
TRANSFORMATIONS
Transformational implementation: An example
[AD-A101994] N81-31891
TRANSFORMATIONS (MATHEMATICS)
Experience with generalized Hough Transform
[AD-A102222] N81-31913
TRANSIENT RESPONSE
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
TRANSISTORS
Monolithic lumped element integrated circuit (M2LEIC) transistors
[AD-A102334] N81-31485
TRANSITION METALS
Certain physical properties of transition metal alloys N81-31333
De HASS-Van Alphen measurements of one-electron and many-body effects in transition metals and intermetallic compounds
[CONF-800864-2] N81-31345
TRANSITION POINTS
Critical dynamics of liquid crystal above the isotropic-nematic phase transition N81-32043
TRANSITION TEMPERATURE
Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels. Part 1: Literature assessment
[SAND-80-0732-PT-1] N81-31349
TRANSLATING
Code translation program for Hewlett-Packard computers
[SAND-81-0627] N81-31897
TRANSMISSION
Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415
TRANSMISSION LINES
HF/UHF low-loss nanosecond variable delay lines
[AD-A102271] N81-31431
Time-domain in analysis of lumped/distributed networks for Electromagnetic Compatibility (EMC) applications --- transmission lines
[AD-A102268] N81-31439
Electric and magnetic field measurements
[PB81-218182] N81-31499
Optical fiber communications cable connector
[AD-A102508] N81-32015
TRANSMISSIONS (MACHINE ELEMENTS)
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549
TRANSMITTER RECEIVERS
Fiber optic transceiver design
[AD-A102362] N81-31425
TRANSONIC FLOW
Some applications of aerodynamic formulations to problems in aircraft dynamics N81-31121
Stall flutter experiment in a transonic oscillating linear cascade
[NASA-TM-82655] N81-31126
Three-dimensional transonic flow analysis
[AD-A101944] N81-31153
Far field conditions in steady flows with a free stream Mach number one
[AD-A102174] N81-31155
National Transonic Facility Fan Blade prepreg material characterization tests
[NASA-TM-81800] N81-31227
TRANSONIC FLUTTER
Stall flutter experiment in a transonic oscillating linear cascade
[NASA-TM-82655] N81-31126
TRANSONIC WIND TUNNELS
The National Transonic Facility: Review and status report N81-31131
The NTF as a national facility N81-31132
NTF and the Department of Defense N81-31133
NTF management considerations N81-31134
Pathfinder model program for the National Transonic Facility N81-31135
Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136

Instrumentation systems for the National Transonic Facility N81-31137
Onset of condensation effects in cryogenic wind tunnels N81-31139
Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140
Wall interference effects: Status review N81-31141
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142
Aircraft design using the National Transonic Facility N81-31143
Proposed aeroelastic and flutter tests for the National Transonic Facility N81-31144
Preliminary user planning for the NASA National Transonic Facility N81-31145
Report of the panel on fluid dynamics N81-31146
High lift technology N81-31147
Configuration aerodynamics N81-31148
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
Report of the wind tunnel/flight correlation panel N81-31150
High Reynolds number research requirements for space vehicle design N81-31151

TRANSPORT PROPERTIES
Process chamber: Heat conduction, diffusion, convection, reaction kinetics, surfaces and wettability under reduced gravity N81-31262
Effect of oscillating flow on combustion rate of coal particles N81-31300
Oxygen diffusion in vanadium-based alloys N81-31338
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant [SAND-80-8190] N81-31657
Computer simulation techniques for artificial modification of the ionosphere [AD-A102302] N81-31722
Banana drift transport in tokamaks with ripple [PPPL-1784] N81-32032

TRANSPORT THEORY
Research program of the Special Research Division 80, 1981 to 1983 --- propagation and transport phenomena in flows [KU-SFB-80/A/166] N81-31521
Electron transport, chemistry and optical emissions in the auroral E-layer [AD-A102345] N81-31725
Simple fast routine for computation of energy transport by synchroton radiation in Tokamaks and similar geometries [SAI-023-81-189-LJ] N81-32040
Profile effects of synchrotron radiation in deuterium-fueled Tokamaks [SAI-023-81-215-LJ] N81-32041

TRANSPORTATION
A review of The Department of Transportation regulations for transportation of radioactive materials, revised 1980 N81-31161
The development and application of a disaggregate Poisson model for trip generation [IWIS-A-80-VK-01-01] N81-32090

TRANSPORTATION ENERGY
Methane Transportation Research, Development, and Demonstration Act of 1980 [PUBL-96-126] N81-31381

TRANSVERSE ACCELERATION
Sensitivity of aircraft motion to cross coupling and acceleration derivatives N81-31120

TRAVELING SOLVENT METHOD
Solvent zone crystallization of CdTe in a mirror heating facility --- orientation experiments for space manufacturing N81-31256
Melting-pot free production of 3-5 semiconductor crystals in a mirror oven --- by traveling solvent method N81-31257

TREADMILLS
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833

TRENDS
A United Kingdom view on future fuels [PNR-90068] N81-31398

TRIANGLES
Mode theory for an equilateral triangular dielectric waveguide N81-31478

TRIANGULATION
Determination of plumb line curvatures by astronomical and gravimetric methods [PB81-198723] N81-31736

TRIGGER CIRCUITS
Optical triggering of power thyristors [BMFT-FB-T-80-083] N81-31493

TROPICAL REGIONS
Drifting buoy data from the tropical Pacific Ocean during NORPAX equatorial test shuttle experiment [PB81-198939] N81-31807

TROPICAL STORMS
Further analysis of tropical cyclone characteristics from rawinsonde compositing techniques [AD-A102053] N81-31785
Tropical cyclones (1980): Central Pacific [PB81-198699] N81-31799

TROPOSPHERE
Satellite measurements of tropospheric aerosols [NASA-CR-3459] N81-31680
Possible influence of solar rotation on tropospheric circulation N81-31762

TROPOSPHERIC SCATTERING
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting [AD-A102309] N81-31802

TUNABLE LASERS
Absorption spectroscopy of combustion gases using a tunable diode laser N81-31302
Electron beam pumped tunable excimer lasers N81-31533
Remote atmospheric measurments with a tunable infrared laser source --- pollution monitoring N81-31985

TUNGSTEN
Electrochromism in thin films of tungsten trioxide and neodymium-doped tungsten trioxide N81-32053

TURBINE BLADES
Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures [NASA-CR-161842] N81-31192
Automated Plasma Spray (APS) process feasibility study [NASA-CR-165418] N81-31193
Advanced turbine blade tip seal system N81-31205
Living with defects in powder metallurgy materials --- turbine blades [PNR-90065] N81-31352
Aeroelastic analysis of a troposkien-type wind turbine blade [NASA-CR-165764] N81-31629
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity [NASA-TM-82690] N81-31956

TURBINE ENGINES
Improving turbine engine compressor performance retention through airfoil coatings N81-31203
General review of the MOSTAS computer code for wind turbines [NASA-CR-165385] N81-31628

TURBINE PUMPS
Small hydro plant development program [DOE/ID-01570/T21-VOL-2-APP-A-K] N81-31652

TURBOCOMPRESSORS
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows [AD-A102170] N81-31219
Prevention of corrosion and fatigue failure of helicopter gas turbine compressors [NLR-MP-80024-U] N81-31222
Unsteady effects of circumferential pressure distorted inlet flows in compressors [AD-A102330] N81-31514

TURBOFAN ENGINES
Structures performance, benefit, cost-study [NASA-CR-165456] N81-31194
Advanced subsonic transport propulsion [NASA-TM-82696] N81-31195
JT8D engine performance retention N81-31200
The nature of operating flight loads and their effect on propulsion system structures N81-31207
CF6-50 engine emissions testing with traverse probe [AD-A102159] N81-31218
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine [AD-A102257] N81-31220
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity [NASA-TM-82690] N81-31956
Turbomachinery noise studies of the AiResearch QCGAT engine with inflow control [NASA-TM-82694] N81-31957

TURBOMACHINERY
High temperature turbine technology program. Phase 2: Technology test and support studies [CW-WR-76-02086] N81-31554
Turbomachinery noise studies of the AiResearch QCGAT engine with inflow control [NASA-TM-82694] N81-31957

TURBOPROP AIRCRAFT
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane [NASA-CR-165768] N81-31184

TURBOPROP ENGINES
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane [NASA-CR-165768] N81-31184

TURBULENCE
Numerical simulation of mesoscale atmospheric circulations over the Lake Michigan area [CONF-801102-38] N81-31790

TURBULENT BOUNDARY LAYER
Theoretical and experimental investigation of coherent structure in the turbulent boundary layer [AD-A102368] N81-31511
Turbulent boundary layer flow through a gap in a wall-mounted roughness element [AD-A102324] N81-31516

TURBULENT FLOW
Applications of Rayleigh scattering to turbulent flows with heat transfer and combustion [AD-A102176] N81-31510
Statistical constraints on scalar variables in turbulent flows [AD-A102342] N81-31515

TWO DIMENSIONAL BODIES
Dynamics of two-dimensional eye-head tracking [AD-A102369] N81-31842

TWO PHASE FLOW
Three-dimensional model of spray combustion in gas-turbine combustors [AD-A102506] N81-31221

U

ULTRAHIGH FREQUENCIES
HF/UHF low-loss nanosecond variable delay lines [AD-A102271] N81-31431

ULTRASONIC FLAW DETECTION
Reliability of ultrasonic weld interrogation methods, phase 1 [PB81-194177] N81-31560

ULTRASONIC TESTS
Development of fracture toughness measurement capability by ultrasound [BDX-613-2625] N81-31586

ULTRAVIOLET RADIATION
Electron transport, chemistry and optical emissions in the auroral E-layer [AD-A102345] N81-31725
Quasi-biennal oscillation of solar activity and its control of the Earth's climate --- solar neutrinos N81-31761
A review of observational evidence for short and long term ultraviolet flux variability of the Sun N81-31783
Repair and cell cycle response in cells exposed to environmental biohazards [DOE/EV-04568/T1] N81-31814
The solar spectral irradiance 1200-3184 a near solar maximum, 15 July 1980 [NASA-CR-164727] N81-32107

ULTRAVIOLET SPECTRA
Matrix isolation spectra and structures of unstable molecules N81-31961
The solar spectral irradiance 1200-3184 a near solar maximum, 15 July 1980 [NASA-CR-164727] N81-32107

ULTRAVIOLET SPECTROMETERS
An instrument to measure the solar spectrum from 170 to 3200 mm on board Spacelab N81-31781
ULTRAVIOLET SPECTROSCOPY
Time resolved UV-spectroscopy of NH3 molecules vibrationally excited by CO2 laser radiation
[PLF-31] N81-31543
UNDERGROUND EXPLOSIONS
Direct method determination of the gas content of coal: Procedures and results
[PB81-196735] N81-31401
Deterministic methods of seismic source identification
[AD-A102333] N81-31723
UNDERGROUND TRANSMISSION LINES
Detection instrumentation for cable shield defects
[PB81-194540] N81-31496
Modal noise in optical fibers and signal fluctuations in an underground laid optical cable
[FUB-44-1980] N81-32010
Signal fluctuations in an underground laid optical cable --- optical measurement N81-32012
UNIONS (CONNECTORS)
Universal connectors for joining stringers
[NASA-CASE-LAR-12744-1] N81-31551
UNIQUENESS THEOREM
On a generalized Falkner-Skan equation --- existence and uniqueness
[NLR-MP-80035-U] N81-31919
UNIVAC 1100 SERIES COMPUTERS
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
UNSTEADY FLOW
Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149
UPGRADING
FAVS enhancements
[AD-A102218] N81-31883
URBAN DEVELOPMENT
Overview of energy-conserving development planning and design techniques based on five case studies
[ANL/CNSV-TM-59] N81-31644
Barrier Island development near four National seashores
[PB81-196313] N81-31804
URBAN PLANNING
Overview of energy-conserving development planning and design techniques based on five case studies
[ANL/CNSV-TM-59] N81-31644
URBAN RESEARCH
A dynamic model of the urban process
[PB81-196990] N81-31694
URBAN TRANSPORTATION
Wisconsin manual to coordinate elderly and handicapped transportation services in rural and small urban counties
[PB81-197865] N81-32091
USER MANUALS (COMPUTER PROGRAMS)
Mail LOG: Program operating instructions
[NASA-CR-159065] N81-31881
Generalized monitoring facility. User's manual
[AD-A102392] N81-31887
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems. Volume 2: Subprogram description --- geothermal drilling
[SAND-80-7154/2-VOL-2] N81-31899
UTAH
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611

V

V-2 MISSILE
Solid rocket booster thrust vector control V-2 off-nominal testing
[NASA-TM-82439] N81-31283
VACUUM EFFECTS
Evolution of fuel nitrogen during the vacuum thermal devolatilization of coal
[DOE/ET-10744/T3] N81-31390
VACUUM MELTING
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 2: Furnace fused MCrAl coatings
[DOE/ET-10245/1-VOL-2] N81-31351
Method for preparing ferrochromium alloys by vacuum reduction and simple melting of reduced products
[PB81-197196] N81-31357
VACUUM TESTS
Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537
VANADIUM
Hydrogen in metals N81-31335
VANADIUM ALLOYS
Oxygen diffusion in vanadium-based alloys N81-31338
Development of fracture toughness measurement capability by ultrasound
[BDX-613-2625] N81-31586
VARIABILITY
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
Variable corpuscular and electromagnetic emissions from the Sun N81-31751
VARIABLE GEOMETRY STRUCTURES
Structural design of a large deformable primary mirror for a space telescope N81-31984
VARIANCE (STATISTICS)
Shrinkage in principal components with applications to factor analysis N81-31922
Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945
Tests for standardized generalized variances of multivariate normal populations of possibly different dimensions
[AD-A102021] N81-31948
VARIATIONS
Analysis of local variations in free field seismic ground motion N81-31709
VECTOR ANALYSIS
Construction of integer-vector library routines for the CRAY computer
[SAND-81-8214] N81-32075
VECTOR CURRENTS
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487
VEGETATION GROWTH
Meteorological satellite data: A tool to describe the health of the world's agriculture
[E81-10204] N81-31596
Hierarchical set of models for estimating the effects of air pollution on vegetation
[UCRL-85367] N81-31682
VELOCITY MEASUREMENT
Laser Doppler anemometry and its application to flow measurements --- numerical flow computation aided by anemometry N81-31995
VERBAL COMMUNICATION
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
VERTEBRATES
Vertebrate behavior and ecology
[DOE/EV-01332/T1] N81-31684
VERTICAL AIR CURRENTS
Some aspects of fluctuating vertical wind shears
[PNL-3771] N81-31792
VERTICAL ORIENTATION
Determination of plumb line curvatures by astronomical and gravimetric methods
[PB81-198723] N81-31736
VERY HIGH FREQUENCIES
The collinear coaxial array antenna
[RSRE-MEMO-3350] N81-31444
VESTIBULAR NYSTAGMUS
The effect of noise on the vestibular system N81-31455
VIBRATION MEASUREMENT
Measurements of the CO laser characteristics by medium modulation N81-31534
Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848
VIBRATION METERS
Ride quality meter
[NASA-CASE-LAR-12882-1] N81-31848
VIBRATION TESTS
Applications of half-model technique in dynamic stability testing N81-31114
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine
[AD-A102257] N81-31220
Aeroelastic instability stoppers for wind-tunnel models
[NASA-CASE-LAR-12458-1] N81-31230
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585
On the application of a TV-multipoint x-y tracker to the measurement of the transmissibility of human vibration --- a mechanical impedance model N81-31846
VIBRATIONAL SPECTRA
Time resolved UV-spectroscopy of NH3 molecules vibrationally excited by CO2 laser radiation
[PLF-31] N81-31543
VIDEO EQUIPMENT
An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826
VIRGINIA
Cross-strike structural discontinuties-tear faults and transfer zones in the central Appalachians of West Virginia N81-31712
VIRUSES
Membrane-membrane interactions in a lipid-containing bacteriophage system
[DOE/EV-03211/32] N81-31813
VISCOELASTICITY
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581
VISCOSITY
Polyacrylamide polymer viscosity as a function of brine composition
[DOE/BETC/RI-80/12] N81-31373
VISCOUS FLOW
A calculation method for the viscous flow around multi-component airfoils
[NLR-TR-79097-U] N81-31523
Computation aspects and results of low-speed viscous flow about multicomponent airfoils
[NLR-MP-80034-U] N81-31526
VISCOUS FLUIDS
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406
VISIBILITY
Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784
Problems arising from the wearing of head equipment N81-31853
VISION
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849
Problems arising from the wearing of head equipment N81-31853
Problems in aeronautics posed by visual deficiencies N81-31855
VISUAL ACUITY
BIOCONAID system (bionic control of acceleration induced dimming)
[AD-A102510] N81-31234
VISUAL AIDS
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849
VISUAL PERCEPTION
Dimensions of the information transfer problem --- human performance N81-31163
Perception of spatial features with stereoscopic displays
[AD-A102156] N81-31436
Modeling the effects of sustained accelerations on pilot tracking performance N81-31839
The effects of altered sensory input on a skilled motor task N81-31840
Dynamics of two dimensional eye-head tracking
[AD-A102369] N81-31842
Conventional optical correction of ametropias in aeronautics N81-31850
Computing with connections --- computer modeling of animal brains: vision
[AD-A102221] N81-31885

VISUAL SIGNALS
Voice warning systems: Some experimental evidence concerning application N81-31458
VOICE
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
The speed of response to synthesized voice messages N81-31456
Voice warning systems: Some experimental evidence concerning application N81-31458
VOICE COMMUNICATION
Information transfer problems in the aviation system
[NASA-TP-1875] N81-31162
Information transfer within the cockpit: Problems in intracockpit communications N81-31167
Investigation of parameters affecting voice recognition systems in C3 Systems
[AD-A102371] N81-31426
A longitudinal study of computer voice recognition performance and vocabulary size
[AD-A102208] N81-31427
Aural communication in aviation
[AGARD-CP-311] N81-31449
Voice communication research and evaluation system N81-31450
Voice communications jamming research N81-31451
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
Second language speech comprehension in noise: A hazard to aviation safety N81-31463
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
STI: An objective measure for the performance of voice communication systems N81-31465
Some applications of the STI-method in evaluating speech transmission channels N81-31466
Voice communication capability of selected inflight headgear devices N81-31467
An automated multiple choice intelligibility testing system N81-31468
An active noise reduction system for aircrew helmets N81-31470
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474
VOICE DATA PROCESSING
Recognition test for an open set of talkers represented by their acoustic parameters
[FUB-2-1981] N81-31446
Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
VOLCANOES
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
VOLTAGE GENERATORS
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481
VORTICES
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154
Gortler vortices and transition in wall boundary layers of two Mach 5 nozzles
[NASA-TP-1869] N81-31509
VORTICITY
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow
[NASA-CR-3466] N81-31127
VOYAGER 1 SPACECRAFT
Voyager backgrounder
[NASA-NEWS-RELEASE-81-116] N81-32102
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106
VOYAGER 2 SPACECRAFT
Voyager backgrounder
[NASA-NEWS-RELEASE-81-116] N81-32102

W

WAFERS
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056
WALKING
The effects of altered sensory input on a skilled motor task N81-31840
WALL FLOW
Report of the panel on theoretical aerodynamics N81-31152
WARNING SYSTEMS
Aural communication in aviation
[AGARD-CP-311] N81-31449
The speed of response to synthesized voice messages N81-31456
Assessing the effectiveness of auditory warnings N81-31457
Voice warning systems: Some experimental evidence concerning application N81-31458
WASTE DISPOSAL
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
A special report to the President and Congress: The role of the ocean in a waste management strategy N81-31679
Environmental analysis burial of offsite low-level waste at SRP
[DPST-80-466] N81-31982
WASTE TREATMENT
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
Biological reduction of nitrate wastewater using fluidized-bed bioreactors
[CONF-810554-2] N81-31812
WASTE UTILIZATION
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399
Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
WASTES
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391
WATER DEPTH
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
WATER FLOW
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
WATER HEATING
Performance analysis of dedicated heat-pump water heaters in an office building
[SERI/TP-721-1198] N81-31404
Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625
Solar space- and water-heating system at Stanford University. Central Food Services Building
[DOE/CS-31522/T2] N81-31655
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668
WATER MANAGEMENT
Essentials of ground-water hydrology pertinent to water-resources planning
[BULL-16-REV] N81-31606
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
WATER POLLUTION
Interchange of pollutants between groundwater and and mineral strata as applied to waste chemical dumps and in situ coal gasification sites
[PB81-198335] N81-31697
Cost effective stream and effluent monitoring
[PB81-202210] N81-31701
WATER QUALITY
Water resources data for Maryland and Delaware, water year 1980
[PB81-195885] N81-31616
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693
WATER RESOURCES
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674
Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698
WATER RUNOFF
Development of a streamflow forecasting procedure for intermountain basins
[PB81-198442] N81-31619
WATER TREATMENT
Precipitation and inactivation of phosphorus as a lake restoration technique
[PB81-196511] N81-31617
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693
Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698
Biological reduction of nitrate wastewater using fluidized-bed bioreactors
[CONF-810554-2] N81-31812
WATER WAVES
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies
[NMI-R-71] N81-31522
Normal mode global Rossby waves: Theory and observations N81-31704
A numerical model study of long-term planetary wave predictability N81-31710
Tide tables 1982. High and low water predictions for West Coast of North and South America including the Hawaiian Islands
[PB81-199598] N81-31805
WATERWAYS
Mariners Weather Log, volume 25, no. 1
[PB81-195414] N81-31796
WAVE DIFFRACTION
Wave forces on cylinders and spheres in the diffraction regime --- water wave forces on immersed bodies
[NMI-R-71] N81-31522
WAVE EQUATIONS
Thermal shocking an elastic half-space with a laser pulse N81-31562
WAVE FRONTS
Wavefront errors produced by multilayer thinfilm optical coatings N81-31983
WAVE PROPAGATION
Plane-strain surface waves in a laminated composite
[AD-A102087] N81-31440
Mode theory for an equilateral triangular dielectric waveguide N81-31478

Table of the modified Bessel functions of orders zero and one together with the function phi(z) = (21sub1)(z)/(zlsub0)(z) and its reciprocal for complex argument
[AD-A102444] N81-31912

WAVE REFLECTION
Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415

WAVE SCATTERING
Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415
Resonators with small apertures N81-31572

WAVEGUIDES
Integral-operator analysis of open-boundary dielectric waveguides N81-31414

WEAR
JT9D jet engine diagnostics program N81-31199
Improving turbine engine compressor performance retention through airfoil coatings N81-31203
Advanced turbine blade tip seal system N81-31205

WEAR TESTS
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites
[RAE-TR-75144] N81-31297

WEATHER
Dissemination of weather information in the air traffic control system
[AD-A102027] N81-31787
Maui optical site, Mount Halekualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F
[AD-A102394] N81-31788
Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789
Mariners weather log, volume 24, number 6, November-December 1980
[PB81-195372] N81-31795

WEATHER FORECASTING
Improved weather services for helicopter operations in the Gulf of Mexico
[AD-A102209] N81-31786
Ocean services for the nation. National ocean goals and objectives for the 1980's
[PB81-200602] N81-31808

WEATHER MODIFICATION
The changing atmosphere: Its role in climate --- biological aspects N81-31776
Convective cloud modification potential in Illinois compared with that for south Florida and deduced from soundings and cloud physics measurements
[PB81-198681] N81-31798

WEATHER STATIONS
Improved weather services for helicopter operations in the Gulf of Mexico
[AD-A102209] N81-31786

WEAVING
Toward optimization of the woven flywheel
[UCRL-15359] N81-31294
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method
[SNIAS-802-422-104] N81-31296

WEIGHTING FUNCTIONS
The equivalence of linearly constrained optimum array weight vectors under different optimization criteria
[AD-A102323] N81-31434
On the numerical analysis of the weight optimization of geodetic nets --- second order design
[SER-C-256] N81-31734
An asymptotic expansion of the distribution of the weighted-difference classification criterion for discrimination of two and three multivariate normal populations N81-31926
Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945

WEIGHTLESSNESS
Demonstration of the separation behavior of alloys using transparent model systems --- for zero gravity application N81-31253
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810
Storage of fluids and fuels in large tanks under zero gravity N81-32007

WELD STRENGTH
Digitally-controlled adaptive welding system
[PB81-183907] N81-31556

WELDED JOINTS
Reliability of ultrasonic weld interrogation methods, phase 1
[PB81-194177] N81-31560

WELDING
Progress in the battle with the burr
[BDX-613-2306] N81-31552

WELLS
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems, volume 1 --- modeling geothermal drilling costs
[SAND-80-7154/1-VOL-1] N81-31898

WEST VIRGINIA
Cross-strike structural discontinuties-tear faults and transfer zones in the central Appalachians of West Virginia N81-31712

WET CELLS
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables
[AD-A102083] N81-31639

WETTABILITY
Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713

WHEAT
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614

WHITE DWARF STARS
Accreting white dwarf models for type 1 supernovae. 1: Presupernova evolution and triggering mechanisms
[NASA-TM-83810] N81-32100

WIDEBAND COMMUNICATION
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting
[AD-A102309] N81-31802

WIND MEASUREMENT
Wind measurements by parachute
[FOA-C-20344-D2] N81-31748
Some aspects of fluctuating vertical wind shears
[PNL-3771] N81-31792

WIND SHEAR
Some aspects of fluctuating vertical wind shears
[PNL-3771] N81-31792

WIND TUNNEL APPARATUS
Wind-tunnel measurement of aerodynamic derivatives using flexible-sting rigs N81-31110
Rotary and Magnus balances N81-31111
Support interference N81-31113
Instrumentation systems for the National Transonic Facility N81-31137

WIND TUNNEL CALIBRATION
The National Transonic Facility: Review and status report N81-31131
Wall interference effects: Status review N81-31141
Report of the wind tunnel/flight correlation panel N81-31150

WIND TUNNEL MODELS
Applications of half-model technique in dynamic stability testing N81-31114
Pathfinder model program for the National Transonic Facility N81-31135
Aeroelastic instability stoppers for wind-tunnel models
[NASA-CASE-LAR-12720-1] N81-31229
Aeroelastic instability stoppers for wind-tunnel models
[NASA-CASE-LAR-12458-1] N81-31230

WIND TUNNEL NOZZLES
Gortler vortices and transition in wall boundary layers of two Mach 5 nozzles
[NASA-TP-1869] N81-31509

WIND TUNNEL STABILITY TESTS
Dynamic Stability Parameters --- conferences
[AGARD-LS-114] N81-31105
Review of techniques for determination of dynamic stability parameters in wind tunnels N81-31108
Direct forced-oscillation techniques for the determination of stability derivatives in wind tunnels N81-31109
Rotary and Magnus balances N81-31111
Curved-flow, rolling-flow, and oscillatory pure-yawing wind-tunnel test methods for determination of dynamic stability derivatives N81-31112
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142

WIND TUNNEL TESTS
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
NTF and the Department of Defense N81-31133
Instrumentation systems for the National Transonic Facility N81-31137
Aircraft design using the National Transonic Facility N81-31143
Proposed aeroelastic and flutter tests for the National Transonic Facility N81-31144
Preliminary user planning for the NASA National Transonic Facility N81-31145
Report of the panel on fluid dynamics N81-31146
High lift technology N81-31147
Configuration aerodynamics N81-31148
High Reynolds number research requirements for space vehicle design N81-31151
Report of the panel on theoretical aerodynamics N81-31152
Comparison of hot and cold subsonic jets in external flow with reference to jet engine simulation
[NLR-TR-80042-U] N81-31156
Unsteady airloads on oscillating wings in post-stall condition
[DFVLR-FB-81-16] N81-31158
Effects of blade-vane ratio and rotor-stator spacing of fan noise with forward velocity
[NASA-TM-82690] N81-31956

WIND TUNNEL WALLS
Wall interference effects: Status review N81-31141

WIND VELOCITY MEASUREMENT
Accommodations assessment: Spaceborne Doppler lidar wind measuring system
[NASA-TM-82435] N81-31744

WINDPOWERED GENERATORS
General review of the MOSTAS computer code for wind turbines
[NASA-CR-165385] N81-31628
Aeroelastic analysis of a troposkien-type wind turbine blade
[NASA-CR-165764] N81-31629
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791

WINDS ALOFT
Atmospheric environment for space shuttle (STS-1) launch
[NASA-TM-82436] N81-31743

WING OSCILLATIONS
Unsteady airloads on oscillating wings in post-stall condition
[DFVLR-FB-81-16] N81-31158

WING ROOTS
Preliminary results of buffet tests in a cryogenic wind tunnel --- conducted in Langley 0.3 m transonic cryogenic tunnel
[NASA-TM-81923] N81-31124

WINGS
GRID3O: Computer program for fast generation of multilevel, three-dimensional boundary-conforming O-type computational grids
[NASA-TP-1920] N81-31128

WINTER
Meteorological data. Volume 2, number 2: Synoptic stratopause method for computation of temperature profiles from satellite measurements of the infrared radiation during winter warmings, series A monographs
| ISSN-0342-4324 | N81-31740
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along lattitude 50 N for summer and winter, series A monographs --- including geostrophic winds
| ISSN-0342-4324 | N81-31741
WORDS (LANGUAGE)
Cursive script word recognition N81-31878

X

X RAY ABSORPTION
Structural chemistry of the marine manganate minerals N81-31714
X RAY APPARATUS
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator
| LA-UR-81-1442 | N81-32029
X RAY SPECTROSCOPY
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307
Structural chemistry of the marine manganate minerals N81-31714
X RAYS
Development of X-ray laser media: Measurement of gain and development of cavity resonators for wavelengths near 130 Angstroms
| AD-A102335 | N81-31539
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
| NASA-CR-164724 | N81-31719
X-Y PLOTTERS
Simplified plotting package for the LSI-11 computer and Tektronix terminals
| GA-A-16148 | N81-31896

Y

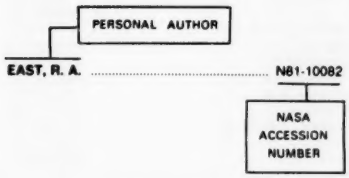
YAG LASERS
Joint European Torus (JET) design study 8.3: Quasi-continuous laser scattering. Part 2: Extension to spatial scan
| IPF-81-3-PT-2 | N81-31544
YAW
Generalized dynamic stability for linearized yawing motion --- The stability of spinning projectiles
| RMCS-80002 | N81-31225
YTTRIUM
Effect of Yttria additives on properties of pressureless-sintered silicon nitride
| NASA-TP-1899 | N81-31366
YTTRIUM OXIDES
Microstructure and mechanical properties of bulk yttria-partially-stabilized zirconia
| NASA-CR-165402 | N81-31340

Z

ZETA PINCH
Nanosecond CO2 laser interaction with a dense helium Z-pinch plasma N81-32024
ZONE MELTING
Marangoni convection in a rotating melting zone N81-31264

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABBOTT, D. E. N81-31511
ADAMS, R. J. N81-31238
ADAMS, W. A. N81-31482
ADAMSON, M. J. N81-31289
ADKINS, A. N81-31181
ADRIAN, D. D. N81-31701
AGRAWAL, S. S. S. N81-31503
AHL, E. L., JR. N81-31227
AHLQUIST, J. E. N81-31704
AKERSTROM, T. N81-31583
ALEXANDER, J. K. N81-32095
ALFVEN, H. N81-32106
ALLEN, J. L. N81-31439
ALLEN, S. L. N81-31486
ALLISON, P. N81-31974
ALMROTH, B. O. N81-31579
ALTING-MEES, H. R. N81-32096
ANDERLE, R. J. N81-31727
ANDERSEN, M. A. N81-32051
ANDERSEN, N. B. N81-31202
ANDERSON, D. L. N81-31716
ANDERSON, D. Z. N81-31527
ANDREOZZI, A. N81-31447
ANTON, H. S. N81-31243
ARCHAMBEAU, C. B. N81-31723
ARCHER, D. H. N81-32013
ARDEMA, M. D. N81-31185
ARDOUIN, B. N81-31766
ARGO, H. V. N81-32110
ARIAS, A. N81-31366
ARLOTTA, R. N81-31447
ARMSTRONG, J. M. N81-31669
ASARO, R. J. N81-31346
ASGARPOUR, S. N81-31504
ASHCRAFT, R. W. N81-31395
ASHTON, D. N81-31967
ASHWORTH, B. R. N81-31232
ASTRIDGE, B. L. N81-31201
ATKINSON, E. N. N81-31817
ATLAS, D. N81-31746
ATTIG, R. C. N81-31518
AUSROTAS, R. A. N81-31160
AUSTIN, W. W. N81-31598
AUXIER, J. A. N81-31824
AXELROD, M. C. N81-31682
AYERS, T. G. N81-31150
AYERS, W. H. N81-31221

B

BAALS, D. D. N81-31130
BABOZA, G. N81-31787
BACA, R. G. N81-31519
BACON, C. F. N81-31609
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BAILEY, D. N81-31480
BAILEY, M. C. N81-31483
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N81-31963
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BALLARD, D. H. N81-31885
N81-31913
BALZER, R. N81-31891
BANDE, J. N81-31827
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BARBALISCIA, F. N81-31445
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BARNES, R. H. N81-31696
BARTH, C. W. N81-31873
BARTHOLOMEW, C. H. N81-31322
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BERGLASS, G. R. N81-31884
BERNARD, A. N81-31177
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BETZ, W. N81-31352
BEWERSDORFF, A. N81-32005
BHATTI, M. A. N81-31410
BIENFAIT, J. M. N81-31775
BILLEN, D. N81-31814
BILLINGS, C. E. N81-31162
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N81-31166
N81-31169
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BINGHAM, G. E. N81-31682
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BLAZER, R. M. N81-31892
BLOCK, L. P. N81-31735
BOBBITT, P. J. N81-31146
BODILLY, S. J. N81-31385
BOEHME, G. N81-31671
BOERIO, F. J. N81-31370
BOETTGER, H. N81-31741
BOLDMAN, D. R. N81-31126
BOLIN, B. N81-31689
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BOOZER, A. H. N81-32032
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BOYLESS, J. A. N81-31210
BOYSAN, F. N81-31221
BRADSHAW, J. D. N81-31303
BRAEDT, M. N81-31265
BRAGG, W. N. N81-31320
BRAMMER, D. J. N81-31444
BRANDT, H. N81-31556
BRAUER, H. N81-31245
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BRIDGES, P. N81-31125
BRINKER, D. J. N81-31623
BRODERICK, D. J. N81-31818
BROGAN, F. A. N81-31579
BRONEZ, T. P. N81-31438
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BROPHY, J. N81-31530
BROWN, C. E. N81-31132
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BRUECKNER, R. N81-31999
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BRULE, M. R. N81-31301
BUBLITZ, P. N81-31158
BUCHAR, C. S. N81-31380
BUCHMUELLER, W. N81-31969
BUCKINGHAM, M. A. N81-31872
BUCKINGHAM, S. L. N81-31588
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BUKOVATZ, J. E. N81-31590
BURDICK, S. A. N81-32055
BURGESS, T. J. N81-31490
BURKHARDT, J. E. N81-32091
BUTLER, P. B. N81-31386

C

CADWELL, J. D. N81-31145
CADZOW, J. A. N81-31438
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CALCOTE, H. F. N81-31319
CALTAGIRONE, J. P. N81-31343
CAMPBELL, S. A. N81-31345
CARCANI, E. N81-31447
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CARNEGIE, R. N81-31967
CARNEY, T. N81-31683
CARRE, R. N81-31830
N81-31832
CARSTEN, J. C. N81-31703
CARTER, N. J. N81-31925
CARVER, C. E. N81-31701
CASPER, T. A. N81-31486
CHAMBERLAIN, R. N81-31195
CHAMBERS, J. R. N81-31112
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CHAN, S. T. N81-31517
CHANDLER, M. O. N81-31718
CHANG, J. S. N81-31730
CHAPMAN, R. H. N81-31609
CHASE, G. W. N81-31609
CHATURVEDI, P. K. N81-31278
CHEANEY, E. S. N81-31162
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CHERTOPRUD, V. E. N81-31760
CHESNUTT, J. C. N81-31344
CHEUNG, J. T. N81-32064
CHEVALDERAUD, J. P. N81-31855
CHEVAPRAVATDUMRONG, W. N81-31564
CHIEN, J. C. N81-31320
CHIN, R. N81-32073
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CHOI, H. J. N81-31336
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CHOW, E. Y. N81-31559
CHRISTENSEN, D. G. N81-31171
CHRISTODOULOU, G. N81-32020
CHRISTOPHER, R. G. N81-31211
CHRULSKI, D. D. N81-31957
CHU, T. K. N81-32034
CHUANG, T. J. N81-31591
CHUN, A. K. T. N81-31799
CHUN, C. H. N81-31264
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CLAUSER, J. F. N81-31486
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CLEMMONS, J. I., JR. N81-31529
CLEVELAND, W. B. N81-31228
CLEVENSON, S. A. N81-31848
CLIFTON, J. R. N81-31495
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CNARE, E. C. N81-31490
COAKLEY, P. N81-31486
COCO, D. S. N81-31705
COE, P. L., JR. N81-31147
COESGEN, F. H. N81-31486
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N81-32112
COFFINBERRY, G. A. N81-31194
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COLEBURN, N. L. N81-31268
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COLLINS, J. N81-31182
COLOMBO, G. N81-31601
COLSTON, E. W. N81-32018
COMPTON, R. T., JR. N81-31430
CONDIT, W. N81-31486
CONNOR, K. A. N81-31981
CONROY, P. J. N81-31731
COOKE, G. D. N81-31617
N81-31620
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COOPER, G. C. N81-31320
CORNELL, R. H. N81-31542
CORREL, D. L. N81-31486
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CRAIK, R. L. N81-31840
CRANE, S. E. N81-31714
CRITCHFIELD, M. O. N81-31233
CROUCH, J. G. N81-31234
CRUMPTON, C. F. N81-31590
CUMMINS, W. C. N81-31486
CUNNINGHAM, A. B. N81-31619
CUNY, J. E. N81-31871
CURTIS, C. W. N81-31391
CURWICK, L. R. N81-31355

D

DAIELLO, R. V. N81-31650
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DANIELSSON, S. G. N81-31212
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DEAVILLEZ, R. R. N81-31338
DEBACKER, G. N81-31835
DEBRUGE, L. L. N81-31219
DECAMARGO, P. C. N81-31333
DECHAUMPHAI, P. N81-31507
DEGRAAF, E. A. B. N81-31189
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DELAFONTAINE, J. N81-31266
DELAHAY, P. N81-31285
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DELUCA, D. P. N81-31192
DELVAILLE, J. P. N81-31719
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DEMPSEY, T. K. N81-31848
DENMAN, E. D. N81-31911
DEOLIVEIRA, J. G. N81-31582
DERAAD, L. L., JR. N81-31584
DERIJK, P. N81-31189
DERKACS, T. N81-31193
DERMERGREDITCHIAN, G. N81-31778
DETRY, J. M. R. N81-31828
DEVAULT, D. S., III N81-31618
DEWITT, D. P. N81-31311
DEWOLF, W. B. N81-31156
DIAMENT, P. N81-31541
DIAMOND, W. P. N81-31401
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DIAZ, A. F. N81-31368
DICARLO, D. J. N81-31122
DICKENSON, K. H. N81-31207
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DIDWALL, E. M. N81-31708
DIENGER, G. N81-31215
DIRR, W. N81-31492
N81-31494
DITTMANN, M. N81-31248
DIZENOBIO, D. N81-31447
DOBERSTEIN, L. N81-31695
DOELLINGER, L. N81-31376
DOGGETT, R. V., JR. N81-31229
N81-31230
DOLLAND, C. R. N81-31480
N81-31481
DONALD, D. W. N81-31661
DONALDSON, C. D. N81-31515
DORAN, J. C. N81-31792
DOSS, T. N81-31639
DOSSENBACH, O. N81-31249
DOST, F. N. N81-31818
DOWSON, D. N81-31550
DOZIER, J. N81-31615
DRAKE, R. P. N81-31486
DRESSELHAUS, G. N81-31316
DRICKAMER, H. G. N81-31488
DRONIOU, J. N81-31831
DUCKETT, C. C. N81-31807
DUFFY, J. W. N81-31171
DULIKRAVICH, D. S. N81-31128
DUNBAR, M. E. N81-31562
DUNGUNDJI, J. N81-31628
DUNN, S. M. N81-31939
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DYE, D. H. N81-31345
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DYSON, R. J. E. N81-31216

E

E., E. N81-31829
EAGLE, K. H. N81-31664
EAKIN, M. E. N81-31924
EARL, H. S., JR. N81-31418
EAST, J. N81-31611
EATON, J. L. N81-31411
ECKERMAN, J. N81-31746
EDELMAN, R. B. N81-31320
EDELSTEIN, R. H. N81-31646
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EDWARDS, J. B. N81-31910
EGGEMEIER, F. T. N81-31104
EHL, J. H. N81-31402
EKBERG, J. N81-31341
ELEK, L. F. N81-31396
EMIN, D. N81-32017
EMTER, D. N81-31733
ENDEMANN, M. J. N81-31985
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ERICSSON, L. E. N81-31113
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ESTABROOKS, P. N81-31967
ESTES, J. M. N81-31421
ETERNO, J. S. N81-31909
EVANGELOU, V. P. N81-31737
EVANS, D. C. N81-31297
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EYER, A. N81-31258
EZZELL, S. N81-31360

F

FAHRENSCHON, K. N81-31492
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FALCONE, P. K. N81-31302
FAMA, V. N81-31870
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FLEMMING, K. N81-31281
FOERSCHING, H. N81-31226
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FONSEKA, G. U. N81-31575
FONTHEIM, E. G. N81-31718
FORGIE, R. E. N81-31853
FORSHAW, S. E. N81-31475
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FOUKAL, P. V. N81-31769
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FOUSHEE, H. C. N81-31167
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FREEMAN, D. C., JR. N81-31151
FREIHAUT, J. D. N81-31390
FRENCH, T. R. N81-31373
FRESE, K. W., JR. N81-31347
FRIEDRICH, L. A. N81-31203
FRISCHAT, G. H. N81-31265
FROEHLICH, G. R. N81-31464
N81-31469
FROST, A. C. N81-31396
FROST, L. W. N81-31290
FUCHS, H. N81-31254
FUELBERG, H. E. N81-31745
FUELLMANN, M. N81-31493
FUESSL, B. N81-31253
FUJIMOTO, T. Y. N81-31862
FULLER, D. E. N81-31140
FURTH, H. P. N81-32034
FURUSTING, H. N81-31857

G

GAEBELEIN, W. N81-31250
GALE, R. N81-31697
GALINDO, I. N81-31755
GALLARDO, Y. N81-31756
GAPOSCHKIN, E. M. N81-31601
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GARINTHER, G. R. N81-31459
GASSEL, S. S. N81-31549

GAULER, A. L. N81-32018
GAUNTHER, D. J. N81-31206
GAY, M. N81-31177
GEMMELL, D. S. N81-31964
GERHARDS, B. N81-31673
GERO, G. H., JR. N81-31887
GERVE, A. N81-31376
GIAMMAR, R. D. N81-31696
GIBBS, A. G. N81-31519
GIBBS, S. E. N81-31443
GILBERT, G. B. N81-31496
GILES, S., JR. N81-31413
GILLEN, M. N81-31405
GILLESPIE, L. K. N81-31552
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GILLILAND, M. W. N81-31649
GILOI, H. G. N81-31442
GILREATH, M. C. N81-31418
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GIST, R. L. N81-31661
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GLASER, F. W. N81-31956
GLASS, D. R. N81-31387
GLOSS, B. B. N81-31148
GLOUDEMANS, M. P. C. N81-31461
GNESES, M. I. N81-31528
GOETHE, H. N81-31825
GOFF, R. C. N81-31787
GOLDBERG, A. N81-31542
GOLDENBAUM, G. C. N81-32036
GOLDSTEIN, J. L. N81-31471
GORECHLAD, A. J. N81-31268
GORECKI, F. D. N81-31437
GRABOWSKI, G. J., JR. N81-31711
GRAFF, C. L. N81-31630
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GRAFF, J. L. N81-31286
GRAFTON, S. B. N81-31112
GRANNEMAN, E. H. A. N81-32036
GRAY, D. A. N81-31434
GRAY, T. I., JR. N81-31596
GRAY, W. M. N81-31785
GRAYSON, R. L. N81-31164
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N81-31166
GREENSFELDER, R. W. N81-31706
GREGER, G. N81-31242
GRENIE, Y. N81-31296
GRESHO, P. M. N81-31517
GRIFFIN, C. R. N81-31421
GRIFFIN, G. R. N81-31452
GRIFFING, G. W. N81-31797
GRIGGS, M. N81-31680
GRINBERG, M. R. N81-31880
GRIVET, C. D. N81-31686
GROSSI, M. N81-31601
GROTEN, E. N81-31736
GRUNE, D. N81-31903
GUARINO, J. F. N81-31137
GUARRERA, G. N81-31870
GUDERLEY, K. G. N81-31155
GUENTHER, P. T. N81-31970
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GUNDMARK, T. N81-31275
GUNNERHED, M. N81-31170
GUPTA, A. S. N81-31948
GUPTA, S. S. N81-31931
GURLAND, J. N81-31346
GYARMATY, J. H. N81-31731

H

HABERLAND, R. N81-31173
HACKLER, D. B. N81-31882
HADDEN, C. T. N81-31814
HAFTKA, R. T. N81-31865
HAGMAN, R. K. N81-31928
HALACY, D. N81-32077
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HALE, K. F. N81-32020
HALEY, A. N81-31886
HALL, R. M. N81-31139
HALLIDAY, S. G. N81-31470
HALS, F. A. N81-31632
HAMEL, P. G. N81-31115
HAMILTON, C. H. N81-31344
HAMLIN, D. A. N81-32016
HAMMER, J. H. N81-32036
HAMMOND, O. H. N81-31406
HAMROCK, B. J. N81-31550
HANCHER, C. W. N81-31812
HANDY, W. E. N81-31294
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HANSEN, J. G. R. N81-31984
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HARDEKOPF, R. A. N81-31894
HARDELL, W. R. N81-31431
HARDY, R. W. N81-31674
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HARRIS, J. M. N81-31800
HARRISON, E., JR. N81-31551
HARSHA, P. T. N81-31320
HART, R. M. N81-31867
HARTMAN, C. W. N81-32036
HARVEY, R. V. N81-31411
HAWKINS, R. A. N81-31717
HAY, W. H. N81-31233
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HEAVLIN, W. D. N81-31944
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HENLINE, P. N81-31896
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HERBERT, G. A. N81-31800
HERRMANN, G. N81-31440
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HIGGINS, C. T. N81-31609
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HOOVER, N. E. N81-32068
HOOVER, W. G. N81-32068
HOPPEL, W. A. N81-31388
HOPPER, D. R. N81-31696
HORAI, K. N81-31500
HORVATH, E. H. N81-31595
HOUSE, E. E. N81-31288
N81-31292
HOUTGAST, T. N81-31465
N81-31466
HOWELL, R. R. N81-31131
HOWERTON, R. J. N81-31979
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HUANG, D. Y. N81-31930
N81-31931
N81-31932
N81-31933
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HUANG, S. M. N81-31391
HUBBARD, E. N. N81-32098
HUBBS, R. B., JR. N81-31656
HUBER, P. N81-31555
HUDSON, W. R. N81-31409
HUGHES, G. W. N81-32065
HUNSAKER, J. C. N81-31293
HUNTER, W. L. N81-31354
HUTCHENS, D. H. N81-31890
HUTCHINSON, D. N81-31967
HWU, F. S. S. N81-31379

I

IBBA, G. N81-31446
IBL, N. N81-31249
IGNAGNI, M. B. N81-31178
IKEDA, S. N81-31934
ILIFF, K. W. N81-31116
IMBROGANO, F. N81-31694
INHABER, H. N81-31640
N81-31822
IVANUSHKINA, T. S. N81-31793

J

JACOBSON, A. R. N81-32037
JACOBSON, I. D. N81-31159
JAEGER, W. N81-31993
N81-31997
JAHNBERG, S. N81-31900
JAHNKE, B. N81-31255
JAMES, A. D. N81-31200
JANSEN, R. N81-31251
JAQLUISH, J. N81-31292
JASPER, G. N81-31743
JAUL, W. K. N81-31535
JEDLOVEC, G. J. N81-31745
JENNINGS, W. C. N81-31981
JERNSTROM, C. N81-31583
JOENSSON, S. N81-31260
JOHANSON, W. R. N81-31345
JOHNSON, D. L. N81-31743
JOHNSON, D. R. N81-31414
JOHNSON, G. M. N81-31129
JOHNSON, J. L. N81-32034
JOHNSON, J. L., JR. N81-31122
JOHNSON, R. R. N81-31576
JOHNSON, W. G., JR. N81-31124
JOHNSTON, M. V., III N81-31305
JOHNSTON, R. P. N81-31194
JONES, L. A. N81-32029
JONES, V. J. N81-31808
JONKERS, H. B. M. N81-31901
JOOS, D. K. N81-31179
JORDAN, M. V. N81-31630
N81-31631
JORDAN, R. R. N81-31354
JUDEIKIS, H. D. N81-31738
JUILLERAT, R. N81-31177
JUNGE, W. N81-31494
JUROSHEK, J. R. N81-31675
N81-31676
N81-31677
JUSTUS, J. R. N81-31385

K

KAISER, M. L. N81-32095
KAISER, R. N81-31298
N81-31299
KANAGASABAY, S. N81-31472
KANAZAWA, K. K. N81-31367
N81-31368
KANEGSBERG, E. N81-31175
KANIA, D. R. N81-32022
KANTER, E. P. N81-31965
KARIM, D. P. N81-31345
KARLSSON, T. N81-31291
KARNICK, H. N81-31173
KARTE, J. N81-31747
KASSNER, M. E. N81-31334
KATHIRESAN, K. N81-31580
KATZOFF, J. A. N81-31385
KAUFFMAN, C. W. N81-31387
KAUFMAN, A. N81-31385
KAUFMAN, S. N81-32092
KAZLAUSKAS, R. J. N81-31286
KEEN, A. N81-31951

KEIHM, S. J. N81-31500
KEINER, H. N81-31492
KELLEY, J. W. N81-31580
KELLY, E. J. N81-31433
KELLY, P. M. N81-31750
KEMP, W. B., JR. N81-31141
KENNEDY, R. H. N81-31617
KENNELL, C. G. N81-31502
KENT, H. J. N81-31215
KERCHER, J. R. N81-31682
KERTH, W. J., JR. N81-31556
KERTH, W. J., SR. N81-31556
KERUT, E. N81-31807
KESSLER, R. N81-31262
KESTELOOT, H. N81-31836
KETTERSON, J. B. N81-31345
KEWISH, R. W., JR. N81-32033
KHALAFALLA, S. E. N81-31356
N81-31357
KHAN, S. Z. N81-31362
KIEHNE, N. N81-31243
KIESEL, H. N81-31733
KIKUCHI, D. A. N81-31926
KILGORE, R. A. N81-31136
N81-31138
KIM, K. Y. N81-31337
KIM, S. W. N81-31534
KIMBALL, J. C. N81-31214
KINCHEN, R. W. N81-31407
KING-HELE, D. G. N81-31267
KING, R. B. N81-31570
KIRCHARTZ, K. R. N81-31997
N81-32003
KITOV, A. N81-31773
KLAUSNER, S. Z. N81-31646
N81-31647
N81-31648
KLEBESADEL, R. W. N81-31963
KLEIN, J. P. N81-31557
KLICH, P. J. N81-31227
KLOPATEK, J. M. N81-31649
KLOPFER, G. H. N81-31154
KNAPP, K. N81-31271
KNAPP, S. F. N81-32091
KNAUSENBERGER, G. E. N81-31174
KNAUSS, W. G. N81-31581
KNOEDLER, R. N81-31671
KNOROVSKY, G. A. N81-31349
KNOWLDEN, R. E. N81-31983
KNOWLES, R. K. N81-31663
KOCH, T. L. N81-31990
KOENIG, K. N81-31125
KOENIG, T. N81-31742
KOLKMAN, H. J. N81-31222
KONINGSVELD, R. N81-31377
KORN, J. N81-31839
KOTASEK, V. N81-32027
KOTTER, F. R. N81-31499
KOURTIDES, D. A. N81-31363
KOVACS, P. N81-31724
KOWALCHUK, M. N81-31812
KOWALIK, W. S. N81-31594
KRAEUTER, R. N81-31861
KRAFT, G. A. N81-31195
KRATZER, D. N81-31916
KRIER, H. N81-31386
KRIVAK, B. M. N81-31818
KROGMANN, U. K. N81-31179
KROUNBI, M. T. N81-31368
N81-31369
KRYSTINIK, L. F. N81-31713
KULL, J. N81-31665
KUMAR, A. N81-31565
KUMAR, R. N81-31905
KUNZ, A. B. N81-32062
KUNZ, C. O. N81-31399
KURAL, M. H. N81-31576
KYR, P. N81-31259

L

LABS, D. N81-31781
LADD, A. J. C. N81-32068
LADSON, C. L. N81-31138
LAIG-HOERSTEBROCK, H. N81-31654
LAMBERT, G. N81-31766
LAMPE, F. W. N81-31325
LANDSMAN, E. E. N81-31491
LANE, K. N81-31968
LANG, J. M. N81-31400
LANGBEIN, D. N81-31253
LANGE, C. S. N81-31815
LANGE, F. F. N81-31372
LANGFORD, B. A., JR. N81-31418
LANGLEY, G. J. N81-31702
LANGSETH, M. G. N81-31500
LARSON, D. L. N81-31659
LAUX, S. E. N81-31479
LAWING, P. L. N81-31136
LEA, K. C. N81-31506
LEATHERWOOD, J. E. N81-31848
LECHEVALIER, R. N81-31668
LEDJEFF, K. N81-31654
LEE, G. K. F. N81-31273
LEE, M. H. N81-32059
LEE, R. L. N81-31517
LEE, S. W. N81-31432
LEE, V. Y. N81-31367
N81-31369
LEFFEL, C. S., JR. N81-31274
LEGRAND, J. P. N81-31752
LEGUAY, G. N81-31831
N81-31834
LEHTO, D. L. N81-31268
LEIGH, R. W. N81-31658
LEISTE, H. N81-31258
LEISTE, M. N81-32008
LENZ, T. G. N81-31393
LETTINGTON, A. H. N81-32021
LEVENTHAL, L. N81-31513
LEVINE, J. R. N81-31401
LEWIS, J. A. N81-31809
LEWIS, L. F. N81-31802
LI, C. M. N81-31874
LICHTENSTEIN, S. N81-31844
LIEBERMAN, A. N81-31308
LIFF, S. N81-31471
LIN, J. S. S. N81-31358
LINDBERG, B. N81-31918
LINDBURG, A. W. N81-31454
LINDE, L. N81-31845
LINDEMANN, O. N81-31912
LINDEN, J. C. N81-31393
LINDGREN, M. N. N81-31408
LINDVALL, T. N81-31950
LINNEROOTH, T. B. N81-31897
LINSKER, R. N81-32032
LIPFERT, F. W. N81-31683
LITTKE, C. J. N81-31261
LITTKE, W. N81-31261
N81-32009
LITZINGER, G. N81-31665
LIU, A. C. N81-32072
LIVINGSTON, J. M. N81-31690
LOEBICH, O. N81-31249
LOFY, R. J. N81-31667
LOGAN, E. N81-31516
LONDON, A. N81-31361
LOO, B. H. N81-31347
LOPICCOLO, M. T. N81-31176
LOVELL, W. A. N81-31184
LOW, A. N81-31825
LOWTHER, R. E. N81-31960
LU, A. H. N81-31399
LUDESCHER, C. N81-32034
LUNDGREN, R. E. N81-31863
LUTHER, F. M. N81-31730
LUTZE, F. H. N81-31112
LYNCH, J. F. N81-31371
LYON, T. F. N81-31218

M

MAARSINGH, R. A. N81-31157
MACCRACKEN, C. D. N81-31669
MACCRACKEN, M. M. N81-31669
MACE, S. A. N81-31284
MACGILLIVRAY, C. S. N81-31271
MACKEY, G. B. N81-31576
MACNEAL, R. H. N81-31271
MAEDER, H. N81-31493
MAELZER, H. N81-31733
MAGNESS, E. R. N81-31597
MAGNUSSON, A. N81-32074
MAIER, R. D. N81-31340
MAINGUY, A. M. N81-31782
MAJMUNDAR, H. H. N81-31609
MAKAR, H. V. N81-31355
MALCOLM, G. N. N81-31107
N81-31111
MALE, J. W. N81-31701
MALLADI, D. P. N81-31306
MANAHAN, S. E. N81-31697
MANENT, P. J. N81-31850
MANESIS, N. J. N81-31295
MANOS, K. L. N81-31167
MANSFIELD, P. J. N81-31515
MANSURIPUR, M. N81-31477
MAR, J. W. N81-31293
MARGASON, R. J. N81-31147
MARINIS, T. F., JR. N81-31329
MARION, C. V. N81-31618
MARKHAM, J. W. N81-31580
MARSHALL, J. H. N81-31821
N81-31823
MARSHALL, T. C. N81-31541
MARTIN, G. L. N81-31184
MARTIN, L. R. N81-31738
MARTIN, P. A. N81-31879
MARTIN, R. L. N81-31207
MARTZLOFF, F. D. N81-31602
MASTERS, B. N81-31665
MATAY, I. M. N81-31193
MAVROMICHALAKI, H. N81-31758
MAYER, G. N81-31353
MAYER, G. J. N81-32014
MAYER, M. S. N81-31454
MCADOO, D. C. N81-31721
MCARDLE, J. G. N81-31957
MCCLANAHAN, M. S. N81-31867
MCCONAGHY, C. F. N81-31489
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MCCULLOUGH, B. F. N81-31409
MCDONALD, F. E. N81-31953
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MCKEAGUE, I. W. N81-31923
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MCKENNA-LAWLOR, S. M. P. N81-32108
MCKINLEY, R. L. N81-31450
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MCKINNEY, L. W. N81-31130
MCKNIGHT, R. H. N81-31499
MCLACHLAN, G. J. N81-31946
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MCMILLAN, D. E. N81-31869
MCNALLEY, G. N81-31807
MCNEILL, G. A. N81-31532
MCQUILLAN, B. N81-31310
MEERTENS, L. G. L. T. N81-31902
MEESE, W. J. N81-31495
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MEHRA, R. K. N81-31909
MEI, L. T. D. N81-31569
MEIER, M. N81-31869
MELCHER, A. G. N81-31660
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MELEASON, E. T. N81-31195
MELIN, J. A. N81-31828
MELTON, R. A. N81-31883
MELTON, R. G. N81-31159
MELTZ, G. N81-31732
MENDILLO, M. N81-31722
MENEGHINI, R. N81-31746
MERGERSON, J. W. N81-31614
MEUNIER, J. N81-31545
MEYER, A. U. N81-31842
MICHALSON, G. M. N81-31126
MICHELS, D. E. N81-31645
MIELKE, J. E. N81-31385
MILEY, G. H. N81-31977
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N81-32031
MILLER, F. Q. N81-31630
N81-31631
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MILLER, R. H. N81-31980
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MILLIKEN, F. P., JR. N81-32060
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MINDLIN, H. N81-31371
MINOR, A. N81-31326
MINSTER, J. B. N81-31716
MINTMIRE, J. W. N81-32048
MIRCHANDANI, P. N81-31694
MISAKIAN, M. N81-31499
MITCHELL, T. E. N81-31340

MITCHNER, J. C. N81-31286
MITRA, A. P. N81-31759
N81-31779
MITTRA, R. N81-31432
MIX, G. N81-32006
MOLNAR, G. N81-31764
MOM, A. J. A. N81-31222
MONEY, K. E. N81-31449
MOORE, K. N81-31701
MOORE, R. K. N81-31746
MOORE, T. J. N81-31451
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N81-31467
MOREHOUSE, J. N81-31668
MOREIRA, A. R. N81-31393
MORGAN, J. L. N81-32026
MORRISON, F. R. N81-31549
MORRISON, L. N81-31404
MORRISON, S. R. N81-31347
MOSEKOT, M. G. N81-31307
MOSES, R. L. N81-31927
N81-31949
MOSKO, J. D. N81-31452
N81-31453
MOSKOWITZ, P. D. N81-31683
MOULUKOVA, N. B. N81-31760
MOUNT, G. H. N81-32107
MOYER, R. A. N81-31982
MUDD, T. N81-31988
MUELLER, G. N81-31259
N81-32002
MUNNIKSMA, B. N81-31156
MURPHY, D. P. N81-32023
MURPHY, J. A. N81-31213
N81-31217
MURPHY, V. G. N81-31393
MUSCHELKNAUTZ, E. N81-31246
MUSTEL, E. R. N81-31760

N

NADEAU, D. N81-32099
NAFZIGER, R. H. N81-31354
NAGEL, A. L. N81-31142
NAGEL, G. N81-31257
NAGLER, M. N81-31987
NARLIKAR, J. V. N81-32071
NAYEBHASHEMI, A. A. N81-31330
NECKEL, H. N81-31781
NEDRUD, B. W. N81-32047
NEEDLEMAN, A. N81-31346
NEIMAN, M. N81-31894
NELSON, R. O. N81-31869
NEMECEK, F. N81-31246
NETTER, G. N81-32007
NEVATIA, R. N81-31893
NEWMAN, J. C., JR. N81-31578
NEWMAN, P. A. N81-31141
NG, P. T. P. N81-31952
NGUYEN, A. T. N81-31501
NICHOLLS, J. A. N81-31387
NICOLIS, C. N81-31777
NIEDERHAUSEN, H. N81-31945
NIELD, G. C., IV N81-31223
NIELSEN, J. N. N81-31154
NIELSEN, N. B. N81-31690
NITSCHE, R. N81-31256
NITZSCHE, F. N81-31629
NIXON, C. W. N81-31462
N81-31467
NOBLE, C. S. N81-31409
NOLL, D. N81-31639
NOMOTO, K. N81-32097
N81-32100
NORDSTROEM, S. N81-31748
NORED, D. L. N81-31195
NOREEN, D. N81-31668
NORTON, F. J. N81-31895
NYGREN, H. N81-31992

O

OBERKAMPF, W. L. N81-31490
OERLEMANS, J. N81-31775
OERTEL, H. N81-31262
N81-31993
N81-31996
N81-32003
OGINO, K. N81-31941
OLEARY, C. O. N81-31110
OLSON, D. B. N81-31319
OLSON, R. E. N81-32030
OLSON, W. P. N81-32101
OLSSON, W. J. N81-31199
OMARA, A. H. N81-31765
ONCLIN, H. M. N81-31377
ONG, R. S. B. N81-31718
OOSTERVELD, W. J. N81-31455
OREILLY, F. J. N81-31943
ORITZ, P. N81-31194
ORLIK-RUECKEMANN, K. J. N81-31108
N81-31120
ORR, W. A. N81-31624
ORTIZ, P. N81-31499
ORVILLE, R. E. N81-31726
OSKAM, B. N81-31523
N81-31526
OSSAKOW, S. L. N81-31278
OSTRACH, S. N81-31512
OTAOLA, J. A. N81-31755
OTT, J. H. N81-31633
OTTO, H. N81-31733
OULMAN, C. N81-31693
OWENS, H. K. N81-31692
OZKAPTAN, H. N81-31856

P

PACE, N. N81-31810
PACKER, C. M. N81-31350
N81-31351
PADGETT, W. J. N81-31940
PAGAN, B. N81-31283
PAGAN, G. N81-31225
PAGNAMENTA, A. N81-31821
N81-31823
PAHLMAN, J. E. N81-31356
N81-31357
PALANCZ, B. N81-31378
PALMA, R. L. N81-32103
PALMER, M. F. N81-31618
PALMER, W. F. N81-31597
PAN, A. I. T. N81-31287
PAN, Z. N81-31221
PANCHAPAKESAN, S. N81-31932
N81-31933
PAOLONI, A. N81-31446
PAPOULIS, A. N81-31428
PARABONI, A. N81-31445
PARK, H. K. N81-31331
PARK, K. S. N81-31415
PARK, Y. C. N81-31989
PARKER, J. A. N81-31363
N81-31364
PARKER, J. F., JR. N81-31171
PARKINSON, R. C. N81-31284
PARRISH, R. V. N81-31232
PARRISH, W. D. N81-31990
PARTER, S. V. N81-31916
PASTIELS, R. N81-31781
PATEL, B. G. N81-31921
PATRICK, R. P. N81-31820
PATTERSON, V. L. N81-31630
N81-31631
PATTERSON, W. J. N81-31365
PATTON, B. D. N81-31812
PATZERT, W. N81-31807
PAYNE, S. L. N81-31357
PAZAN, S. N81-31592
PEACOCK, R. E. N81-31514
PEARSON, M. L. N81-31731
PEASE, C. H. N81-31806
PENNER, J. E. N81-31730
PEPPEL, G. N81-31492
PEPPER, D. W. N81-31687
PERDRIEL, G. F. N81-31851
PERKINS, R. A. N81-31350
N81-31351
PERRY, B. D. N81-31424
PERRY, R. L. N81-32070
PETERSEN, W. A. N81-31355
PETES, J. N81-31268
PETROPOULOS, B. N81-31758
PETTIGREW, J. L. N81-31209
PETZOLDT, K. N81-31740
PFITZER, K. A. N81-32101
PHILLIPS, E. P. N81-31577
PIANTANIDA, T. P. N81-31436
PIAZZOLLA, S. N81-32010
N81-32011
N81-32012
PICK, M. N81-31751
PIETIKANENEN, M. N81-31908
PINDER, J. T. N81-31201
PINES, S. N81-31224
PISTER, K. S. N81-31410
PITCHFORD, L. C. N81-31972
PITTS, G. C. N81-31810
PLOMP, R. N81-31460
PODZIMEK, J. N81-31703
POE, W. L. N81-31982
POENITZ, W. P. N81-31970
POETSCHKE, J. N81-31252
POLAK, E. N81-31410
POLHAMUS, E. C. N81-31148
POLLOCK, C. R. N81-31536
POLMAN, A. R. N81-31455
POOCK, G. K. N81-31427
POORE, R. V. N81-31869
N81-31894
PORTER, R. F. N81-31168
POWELL, W. N81-31406
PRALY, L. N81-31909
PRATT, R. L. N81-31468
PREISSER, F. N81-31263
PRENTAKIS, A. N81-31406
PRICE, J. E. N81-31184
PRINCE, H. D. N81-32109
PRITCHETT, J. W. N81-31662
PRONO, D. S. N81-32036
PUCCINELLI, E. F. N81-31720
PURMORT, D. N81-31387
PYUN, J. J. N81-31915

Q

QUAM, D. L. N81-31234
QUAYLE, S. S. N81-32088

R

RABIN, J. M. N81-32069
RABO, J. A. N81-31396
RABOLT, J. F. N81-31367
RADA, R. F. N81-31860
RADOMSKI, M. A. N81-31198
RAGONA, R. N81-31446
RAHLMANN, D. F. N81-31810
RAISBECK, G. M. N81-31772
RAJKOTIA, D. P. N81-31566
RAJU, I. S. N81-31578
RAMAMOORTHY, C. V. N81-31864
RAO, K. V. N81-32056
RASOOL, S. I. N81-31780
RASSBACH, M. E. N81-31600
RATCLIFF, B. N. N81-31967
RAUB, J. N81-31249
REDDELL, D. L. N81-31622
REDWINE, S. T., JR. N81-31884
REED, C. L. N81-31803
REED, D. J. N81-31818
REEDER, J. W. N81-31593
REICHEL, C. L. N81-31286
N81-31317
REID, B. K. N81-31875
REINECKE, M. N81-31458
REINHARDT, V. S. N81-31482
REMINGTON, R. W. N81-31452
RENARD, R. J. N81-31784
RENKEY, E. J. N81-31585
RENTEL, A. N81-31326
REPICKY, J. J., JR. N81-31558
RESHOTKO, E. N81-31513
REYNARD, W. D. N81-31163
REYNOLDS, J. R. N81-31367
RHODES, H. E., JR. N81-32045
RHORER, R. L. N81-32018
RICARD, G. L. N81-31232
RICE, J. R. N81-31346
RICE, J. S. N81-31633
RICE, M. H. N81-31662
RICH, C. N81-31888
RICHARDS, J. N81-32063
RICHARDS, P. J. N81-31225
RICHARDS, W. H. N81-31227

RICHARDSON, J. R. N81-31522
RICHARDSON, P. W. N81-31630
N81-31631
RICKETTS, R. H. N81-31229
N81-31230
RIEDINGER, L. L. N81-31321
RIGDON, S. E. N81-31937
RINEY, T. D. N81-31662
RISCH, A. P. N81-31396
ROBBEN, F. N81-31510
ROBERTS, M. L. N81-31194
ROBERTSON, T. N81-31935
ROBINSON, P. H. N81-31650
ROCK, M. N81-31362
ROCKWELL, D. C. N81-31618
RODD, J. L. N81-31233
ROEHR, H. N81-31544
ROELOFS, L. D. N81-32046
ROGALLO, R. S. N81-31508
ROGERS, D. B. N81-31234
ROGERS, J. N. N81-32075
ROHR, F. J. N81-31326
RONDAL, J. N81-31587
ROOD, G. M. N81-31473
ROSENFELD, A. N81-31907
ROSS, A. J. N81-31119
ROSS, S. M. N81-31906
ROTH, J. A. N81-31986
ROTHBERG, P. F. N81-31385
N81-31636
ROTHWARF, F. N81-31955
ROTTMAN, G. J. N81-32107
ROUHANI, R. N81-31909
ROUSE, W. B. N81-31847
ROXBURGH, I. W. N81-31767
N81-31768
ROY, G. D. N81-31518
RUGGIERO, S. T. N81-32044
RUHE, J. R. N81-32018
RUSH, C. M. N81-31732
RUYGROK, C. J. N81-32090
RUZICKA, G. C. N81-31567
RYAN, D. R. N81-31701

S

SABNIS, J. S. N81-31300
SAHA, H. N81-31634
SAHALOS, J. N. N81-31429
SAKAI, H. N81-31315
SAKURAI, K. N81-31761
SALAS, L. J. N81-31328
SALEMME, C. N81-31194
SALTER, L. F. N81-31314
SALZMAN, H. N81-31544
SANAK, J. N81-31766
SANDEL, F. N81-31976
SANDERSON, B. D. N81-31474
SANDRI, G. N81-31515
SAPOWITH, A. D. N81-31294
SARGENT, N. B. N81-31627
SARMA, G. S. R. N81-32004
SAWCHUK, A. N81-31893
SAX, R. I. N81-31798
SBISA, H. E. N81-31819
SCHAEFER, B. N81-31378
SCHARMANN, A. N81-31263
N81-32001
SCHATZMANN, M. N81-31521
SCHEMMER, F. M. N81-31922
SCHIFF, L. B. N81-31106
N81-31121
SCHLEMMER, H. N81-31733
SCHLESINGER, S. P. N81-31541
SCHMITT, G. N81-31734
SCHNEIDER, C. P. N81-31117
N81-31123
SCHNEIDER, G. M. N81-31248
SCHNEIDER, R. N81-31654
SCHOENHOLZ, R. N81-31256
SCHOFIELD, W. H. N81-31516
SCHOONHEYT, J. N81-31455
SCHOONOVER, M. R. N81-32016
SCHORN, A. M. N81-31856
SCHOVE, D. J. N81-31757
SCHOWALTER, L. J. N81-32054
SCHREYER, G. N81-31485
SCHUMACHER, M. N81-31258
SCHUR, W. W. N81-31573
SCHUURMANS, C. J. E. N81-31753
SCHWABE, D. N81-31263
N81-32001
SCHWARTZ, E. N81-31846
SCHWEIGHARDT, F. K. N81-31391
SCOTT, L. N81-31596
SCOTT, M. P. N81-31571
SCOTTI, W. J. N81-32101
SEAGRAVE, J. D. N81-32029
SEAMAN, J. N. N81-31548
SEERY, D. J. N81-31390
SEIGNEURIC, A. N81-31834
SERABIAN, S. N81-31560
SETHURAMAN, S. N81-31729
SEXTON, H. B. N81-31572
SHAH, A. B. N81-31304
SHANNON, J. D. N81-31698
SHAPIRO, D. G. N81-31889
SHAW, J. H. N81-31717
SHAW, R. W. N81-31688
SHEERIN, J. P. N81-32025
SHEFFIELD, J. N81-32039
SHELDON, C. S., II N81-31240
SHEPPARD, C. H. N81-31288
N81-31292
SHER, L. D. N81-31235
SHERMAN, J. D. N81-31974
SHESHADRI, M. S. N81-31432
SHIGEISHI, H. N81-31328
SICHEL, M. N81-31387
SIDOROV, V. V. N81-31793
SIEGEL, A. I. N81-31856
SIEGEL, E. D. N81-31884
SIEGMUND, D. N81-31947
SIEWERT, R. F. N81-31133
SILBER, D. N81-31493
SILVETTI, B. M. N81-31669
SIMMONS, M. M. N81-31385
SIMON, P. A. N81-31752
SIMON, P. C. N81-31761
SINCLAIR, C. K. N81-31980
SINGH, H. B. N81-31328
SINGH, K. N81-31942
SINIFF, D. B. N81-31684
SKIBO, M. D. N81-31295
SLABINSKI, R. J. N81-31176
SLOAN, K. R., JR. N81-31913
SLONINA, J. P. N81-31296
SMALL, S. L. N81-31876
SMAYLING, M. C. N81-31533
SMEETS, G. N81-31994
SMEGGIL, J. G. N81-31339
SMELTZER, R. K. N81-32065
SMITH, A. N81-31328
SMITH, A. B. N81-31970
SMITH, A. H. N81-31810
SMITH, C. R. N81-31511
SMITH, C. V. N81-31580
SMITH, D. H. N81-31717
SMITH, D. M. N81-31898
N81-31899
SMITH, H. V., JR. N81-31974
SMITH, J. M. N81-32026
SMITH, L. C. N81-31281
SMITH, M. J. T. N81-31959
SMITH, W. H. N81-31966
SMOORENBURG, G. F. N81-31460
SNIPES, W. N81-31813
SNUGGERUD, D. N81-31639
SNYDER, W. H. N81-31739
SOCK, F. E. N81-31343
SOFIA, S. N81-31770
SONNENSCHEIN, F. J. N81-31279
N81-31280
SORG, H. W. N81-31172
SORGATO, I. N81-31312
SOUTH, J. C., JR. N81-31152
SPAID, F. W. N81-31153
SPANO, M. L. N81-32057
SRULIJES, J. N81-31997
ST.CLAIR, A. K. N81-31360
ST.CLAIR, T. L. N81-31360
STABRYLLA, R. G. N81-31194
STACY, N. N81-31373
STAINBACK, P. C. N81-31140
STALNAKER, D. K. N81-31308
STASIEWICZ, K. N81-31718
STAVINOHA, L. L. N81-31392
STEA, W. N81-31343
STEARNS, E. N81-31194
STEELE, A. K. N81-31435
STEELE, F. K. N81-31677
STEELE, J. M. N81-31914
STEENEKEN, H. J. M. N81-31465
N81-31466
STEHLING, P. N81-31579
STEIN, R. N81-31607
STEN, G. N81-31917
STEPHENS, D. G. N81-31848
STEPHENS, J. R. N81-31208
STEPHENS, M. A. N81-31943
STEUER, K. H. N81-31544
STEURWALT, M. N81-31916
STEVENSON, J. R. N81-31144
STEWART, F. G. N81-31675
STILES, R. N81-31328
STILLMAN, D. B. N81-31909
STOUDENMIRE, J. H. N81-31496
STRANZ, D. D. N81-31961
STRAUB, J. N81-31247
STREET, G. B. N81-31310
N81-31368
N81-31369
STRICKLAND, D. J. N81-31725
STRICKLIN, R. N81-31197
STROMBERG, W. J. N81-31199
STRONG, R. E. N81-31664
STURMAN, J. C. N81-31282
SUESS, H. E. N81-31771
SUESSENBACH, H. N81-31492
SUNIER, J. W. N81-31869
N81-31894
SUPERZYNSKI, M. J. N81-31953
SURPRENANT, J. N81-31639
SUSSENBACH, H. N81-31494
SUTTON, W. R. N81-32031
SUZUKI, H. N81-31958
SVENSSON, E. N81-31841
SWANSON, G. D. N81-31586
SWARTS, R. E. N81-31176
SWITHENBANK, J. N81-31221
SYMONDS, W. A. N81-31292

T

TALBOT, L. N81-31510
TALBOT, T. N. N81-31784
TALENT, D. L. N81-32093
TAMMA, K. K. N81-31507
TAMOR, S. N81-32040
N81-32041
TARRER, A. R. N81-31391
TARTER, J. G. N81-32105
TASKA, J. N81-32036
TAYLOR, F. R. N81-31238
TAYLOR, G. C. N81-31609
TAYLOR, R. E. N81-31311
TAYLOR, R. L. N81-31940
TAYLOR, T., JR. N81-31555
TEMPLE, W. H. N81-31407
TENNANT, H. R. N81-31858
TENSI, H. M. N81-31254
TENUTA, G. L. N81-31425
TESTER, J. R. N81-31684
THAMES, F. C. N81-31152
THANDERZ, M. N81-31841
THIELE, G. A. N81-31429
THIEMAN, J. R. N81-32095
THIEME, L. G. N81-32087
THOEM, T. L. N81-31691
THOM, R. D. N81-31990
THOMAS, J. N81-31181
THORNTON, E. A. N81-31507
THORPE, R., W. N81-31819
THRUSH, B. A. N81-31314
THUILLIER, G. N81-31781
THURSTON, M. C. N81-32061
TIRSCH, F. S. N81-31701
TOBAK, M. N81-31106
N81-31121
TOBBEN, P. N81-31697
TOCHTERMANN, M. N81-31654
TOLBERT, L. M. N81-31975
TOOMAN, T. P. N81-32075
TOOT, L. N81-31220
TRACK, W. N81-31352
TRENCHARD, M. H. N81-31599
TRUMBO, B. E. N81-31610
TRUMBULE, R. E. N81-31385

TSUTAKAWA, R. K. N81-31937
TULYATHAN, P. N81-31416
TURCK, F. N81-31270
TURNER, W. C. N81-32036
TYE, S. H. H. N81-31969

U

UETE, H. N81-31563
UHM, H. S. N81-31538
UNDERWOOD, R. G. N81-31661
UNESTAAHL, L. E. N81-31841
UPSON, C. D. N81-31517
URTIEW, P. A. N81-31324
UTHE, E. E. N81-31690

V

VABLE, M. N81-31574
VALENTIN, R. N81-31441
VALENTINE, P. G. N81-31340
VANCE, B. N81-31722
VANDERLINDEN, H. H. N81-31589
VANDEVOOREN, A. I. N81-31919
VANESSEN, P. G. N81-32090
VANGESTEL, G. F. J. A. N81-31189
N81-31222
VANWOERKOM, P. T. L. M. N81-31279
N81-31280
VARMA, A. K. N81-31515
VARMA, I. K. N81-31364
VAUGHAN, S. S. N81-32095
VELDMAN, A. E. P. N81-31524
N81-31525
VELDMAN, A. P. N81-31919
VELERA, N. S. N81-31359
VERCHEVAL, J. N81-31269
VERDI, J. S. N81-31191
VERMEULEN, H. C. N81-31212
VERTUT, J. N81-31545
VESSOT, R. F. C. N81-31537
VESTEWIG, R. E. N81-31104
VIDOUSE, F. N81-31587
VINES, R. G. N81-31754
VIOLETTE, E. J. N81-31732
VOGG, H. N81-31376
VOGT, L. N81-31846
VONBAUMGARTEN, R. N81-31244
VONBRIESSEN, R. N81-31274
VONBURG, K. N81-31285
VONMAYRHAUSER, A. K. N81-31865
N81-31866
VONNEGUT, B. N81-31726
VOSS, D. F. N81-32024

W

WAITE, J. H., JR. N81-32104
WALCHER, H. N81-31258
WALDNER, M. N81-31863
WALKER, D. M. C. N81-31267
WALKER, J. D. A. N81-31511
WALKER, J. F., JR. N81-31812
WALKLEY, K. B. N81-31184
WALLACK, B. M. N81-31887
WALTER, R. A. N81-32088
WALTER, W. T. N81-31342
WALTMAN, D. J. N81-31953
WANG, S. Y. N81-32026
WANHILL, R. J. H. N81-31222
WARD, J. M. N81-31268
WASHBURN, G. F. N81-31184
WASHBURN, R. B., JR. N81-31909
WASSELL, A. B. N81-31398
WATANABLE, T. N81-32028
WATERHOUSE, R. N81-31639
WATERS, R. C. N81-31888
WEBB, D. A. N81-31626
WEBB, P. R. N81-31696
WEBER, J. C. N81-31661
WEI, L. J. N81-31940
WEIMER, K. E. N81-32034
WEINBERG, J. I. N81-31954
WEINSTEIN, S. D. N81-31653
WEINZIERL, A. N81-31247
WEISEL, D. R. N81-31200
WELHAN, J. A. N81-31715
WELLER, A. E. N81-31696
WELLS, F. A. N81-31385
WELLS, M. D. N81-31232
WENDELL, J. H. N81-31628
WENZEL, J. N81-31248
WERNSTROEM, H. N81-31170
WEST, E. A. N81-31500
WESTBROOK, S. R. N81-31392
WETHEROLD, R. G. N81-31702
WHEALE, J. L. N81-31456
WHEELER, P. D. N81-31470
WHITE, D. R. N81-31237
WIERZBICKI, T. N81-31582
N81-31583
WIGEN, P. E. N81-32061
WIGGERT, V. N81-31798
WIGLEY, T. M. L. N81-31750
WILCOX, D. E. N81-31621
WILCOX, J. M. N81-31762
WILKINS, P. A. N81-31457
WILLIAMS, D. N81-31444
WILLIAMS, L. D. N81-31750
WILLIAMS, M. B. N81-31505
WILLIAMS, S. D. N81-31882
WILLIAMS, W. J. N81-31187
WILLIS, C. E. N81-31701
WILLOUGHBY, P. W. N81-31787
WILLSKY, A. S. N81-31559
WILSON, E. E. N81-31795
N81-31796
WILSON, R. K. N81-31561
WILSON, T. H. N81-31712
WILSON, T. M. N81-32067
WINDLE, J. N81-31181
WINKLER, J. L., JR. N81-31500
WINSEL, A. N81-31654
WINTER, W. N81-31493
WISNIEWSKI, J. A. N81-31859
WITHAM, C. L. N81-31690
WITTE, D. E. N81-31866
WOBUS, R. L. N81-31710
WOIKE, O. G. N81-31194
WOJCIECHOWSKI, T. A. N81-31388
WOLF, J. J. N81-31856
WOLFOWICZ, W. N81-31920
WOO, J. T. N81-31981
WOOD, R. F. N81-32067
WOODS, C. W. N81-32029
WOODS, J. G. N81-32015
WOODWARD, F. A. N81-31127
WOODWARD, R. L. N81-31546
WOODWARD, R. P. N81-31956
WOODY, C. D. N81-31843
WORTHINGTON, H. N81-32091
WRIGHTON, M. S. N81-31286
N81-31317
WUEBBLES, D. J. N81-31730

X

XANTHAKIS, J. N81-31758

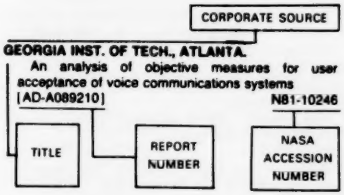
Y

YAMADA, T. N81-31790
YAMAMOTO, Y. N81-31877
YANG, C. L. N81-31396
YANG, P. N81-31698
YASUDA, K. N81-31665
YEI, W. M. N81-31335
YIOU, E. N81-31772
YOLTON, C. F. N81-31344
YOUNG, C. P., JR. N81-31135
YOUNG, T. J. N81-31374
YOUNGS, L. G. N81-31609
YUE, P. C. N81-31703
YUN, S. H. N81-31478

Z

ZALESAK, S. T. N81-31278
ZAMBRANO, T. G. N81-31791
ZARUR, J. N81-31861
ZELAHY, J. W. N81-31205
ZENGERLE, R. N81-32019
ZIAAI-MOAYYED, A. A. N81-31568
ZORDAN, R. D. N81-32052
ZUERN, W. N81-31733
ZUMBERGE, J. F. N81-32113
ZWEBEN, S. N81-31886

Typical Corporate Source Index Listing



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A

A. O. ASSOCIATES, SAN MARINO, CALIF.
Solar activity and variations of meteorological parameters N81-31765

ACADEMY OF ATHENS (GREECE).
Effects of the solar magnetic field on the semiannual intensity of the green coronal line N81-31758

ACADEMY OF SCIENCES (USSR), MOSCOW.
The reality of solar-atmospheric relations and the changes of atmospheric circulation of solar origin N81-31760

ACRES AMERICAN, INC., COLUMBIA, MD.
Small hydro plant development program
[DOE/ID-01570/T21-VOL-2-APP-A-K] N81-31652

ADJUNCT SYSTEMS, INC., HUNTSVILLE, ALA.
Fabrication and testing of a prototype longwall face alignment system
[NASA-CR-161848] N81-31603
Design of a laser system for instantaneous location of a longwall shearer
[NASA-CR-161846] N81-31607

ADVIESBUREAU VOOR GEODESIE, DEVENTER (NETHERLANDS).
Generalization within automated cartographic systems
[RS-07-UT(3)] N81-31612

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE (FRANCE).
Dynamic Stability Parameters
[AGARD-LS-114] N81-31105
Advances in inertial navigation systems and components
[AGARD-AG-254] N81-31172
Factors of safety related to structural integrity. A review of data from military airworthiness authorities
[AGARD-R-677] N81-31186
Aural communication in aviation
[AGARD-CP-311] N81-31449
Sixth advanced operational aviation medicine course
[AGARD-R-681] N81-31827
NATO regulations on the cardio-vascular system N81-31829
Epidemiological basis for the prevention of coronary heart disease N81-31835
Personal visual aids for aircrew
[AGARD-LS-115] N81-31849

AEG-TELEFUNKEN, FRANKFURT AM MAIN (WEST GERMANY).
Optical triggering of power thyristors
[BMFT-FB-T-80-083] N81-31493

AEG-TELEFUNKEN, ULM (WEST GERMANY).
Gas-discharge matrix display
[BMFT-FB-T-80-082] N81-31492
Development of an electrostatic printing process with gas discharge recording writing head
[BMFT-FB-T-80-084] N81-31494

AEROCHEM RESEARCH LABS., INC., PRINCETON, N. J.
Kinetics of some metal atom and metal flouride oxidation reactions relevant to Air Force technology development
[AD-A102415] N81-31318
Ionic mechanisms of carbon formation in flames
[AD-A102411] N81-31319

AERONAUTICAL RESEARCH ASSOCIATES OF PRINCETON, INC., N. J.
Statistical constraints on scalar variables in turbulent flows
[AD-A102342] N81-31515

AERONAUTICAL RESEARCH LABS., MELBOURNE (AUSTRALIA).
Turbulent boundary layer flow through a gap in a wall-mounted roughness element
[AD-A102324] N81-31516

AEROSPACE CORP., EL SEGUNDO, CALIF.
Sulfur dioxide oxidation reactions in aqueous solutions
[PB81-196834] N81-31738

AEROSPACE CORP., GERMANTOWN, MD.
Oil shale surface retorting: Environmental Characterization Information Report
[DOE/EP-0015] N81-31685

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Voice communication research and evaluation system N81-31450
Voice communications jamming research N81-31451
Comparative intelligibility of speech materials processed by standard Air Force voice communication systems in the presence of simulated cockpit noise N81-31462
Voice communication capability of selected inflight headgear devices N81-31467

AEROVIRONMENT, INC., PASADENA, CALIF.
Assessing the local windfield with instrumentation
[PNL-3622] N81-31791

AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER, SCOTT AFB, ILL.
Maui optical site, Mount Halekualia, Hawaii. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts C, E and F
[AD-A102394] N81-31788
Patrick AFB, Cocoa Beach, Florida. Revised Uniform Summary of Surface Weather Observations (RUSSWO), parts A-F
[AD-A102396] N81-31789

AIR FORCE HUMAN RESOURCES LAB., BROOKS AFB, TEX.
Actual versus simulated equipment for aircraft maintenance training: Cost implications of the incremental versus the unique device
[AD-A102388] N81-31104

AIR FORCE INST. OF AVIATION MEDICINE, FUERSTENFELDBRUCK (WEST GERMANY).
The effects of ear protectors and hearing losses on sentence intelligibility in aircraft noise N81-31464
Effects of age, flying time and type of aircraft on the hearing of German military pilots, and its significance for inflight communication N81-31469
Eye protection and tinted lenses N81-31852

AIR FORCE INST. OF AVIATION MEDICINE, MANCHING (WEST GERMANY).
Voice warning systems: Some experimental evidence concerning application N81-31458

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH, BOLLING AFB, WASHINGTON, D.C.
optical rotation rate sensors N81-31174

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Who needs engine monitoring? N81-31209
F100 engine diagnostic system status to date N81-31210

AIR FORCE WRIGHT AERONAUTICAL LABS., WRIGHT-PATTERSON AFB, OHIO.
Determination of aerodynamically adequate fillet geometry in turbocompressor blade rows
[AD-A102170] N81-31219

AIR PRODUCTS AND CHEMICALS, INC., TREXLERTOWN, PA.
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction
[DOE/ET-14806/T4] N81-31391

AIRESEARCH MFG. CO., TORRANCE, CALIF.
Adaptive control system for line-commutated inverters
[NASA-CASE-MFS-25209-1] N81-31480

ALABAMA A & M UNIV., HUNTSVILLE.
Parametric study of thermal storage containing rocks or fluid filled cans for solar heating and cooling, phase 2
[NASA-CR-161841] N81-31634

ALABAMA UNIV., UNIVERSITY.
Instrumental improvements in X-ray photoelectron spectroscopy and applications to glass surfaces N81-31307

ALASKA STATE DEPT. OF NATURAL RESOURCES, JUNEAU.
Geohydrology of the Delta-Clearwater Alaska
[PB81-200651] N81-31621

ALTUS CORP., SAN JOSE, CALIF.
Hi-G lithium thionyl chloride flat cells for artillery/air delivered expendables
[AD-A102083] N81-31639

AMERICAN WATER WORKS ASSOCIATION RESEARCH FOUNDATION, DENVER, COLO.
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693

AMES LAB., IOWA.
Report of the review panel on neutron scattering
[IS-4761] N81-31971

AMMANN AND WHITNEY, NEW YORK.
Blast-resistant capacities of cold-formed steel panels
[AD-A101915] N81-31343

AMPEC CORP., ARLINGTON, MASS.
Research on the optimization of viscous fluid mixing
[PB81-176216] N81-31406

AMSTERDAM UNIV. (NETHERLANDS).
The effect of noise on the vestibular system N81-31455

ANALYTICAL MECHANICS ASSOCIATES, INC., HAMPTON, VA.
Terminal area automatic navigation, guidance, and control 1: Automatic rollout, turnoff, and taxis
[NASA-CR-3451] N81-31224

ANALYTICAL METHODS, INC., BELLEVUE, WASH.
Development of the triplet singularity for the analysis of wings and bodies in supersonic flow
[NASA-CR-3466] N81-31127

ANSCHUETZ AND CO. G.M.B.H., KIEL (WEST GERMANY).
Tuned gyro cost reduction through a novel hinge design N81-31173
APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., SILVER SPRING, MD.
The APL satellite refrigerator program [AD-A102377] N81-31274
Study of geomagnetic storms, solar flares, and centers of activity in 1977 [AD-A102301] N81-32109
APPLIED PSYCHOLOGICAL SERVICES, WAYNE, PA.
Human performance in continuous operations: Description of a simulation model and user's manual for evaluation of performance degradation [AD-A101950] N81-31856
ARGONNE NATIONAL LAB., ILL.
De HASS-Van Alphen measurements of one-electron and many-body effects in transition metals and intermetallic compounds [CONF-800864-2] N81-31345
Numerical simulation of mesoscale atmospheric circulations over the Lake Michigan area [CONF-801102-38] N81-31790
Toward a theory of the initiation of cancer by ionizing radiation: Track structure analysis for electrons and alpha particles in water [CONF-800944-8] N81-31821
Toward a theory of the initiation of cancer by ionizing radiation. The twin doublet pair model [CONF-800944-7] N81-31823
Using an electrostatic accelerator to determine the stereochemical structures of molecular ions [CONF-801111-43] N81-31964
Physics with fast molecular-ion beams [CONF-801111-44] N81-31965
Interpretation and normalization of experimental data for total, scattering, and reaction cross sections [CONF-800979-20] N81-31970
ARGOS ASSOCIATES, INC., WINCHESTER, MASS.
Technology assessment of automotive applications of metal-plastic laminates, volume 1 [PB81-191082] N81-31298
Technology assessment of automotive applications of metal-plastic laminates, volume 2 [PB81-191090] N81-31299
ARIZONA STATE UNIV., TEMPE.
The abundance and distribution of chlorine in meteorites N81-32105
ARIZONA UNIV., TUCSON.
The four-mode linearly-polarized ring laser gyro N81-31527
Spectral properties of Arizona soils and rangelands and their relationship to LANDSAT digital data N81-31595
Wavefront errors produced by multilayer thinfilm optical coatings N81-31983
Structural design of a large deformable primary mirror for a space telescope N81-31984
Design of a spaceborne lightning sensor N81-31987
Striations, swirls, and stacking faults in Czochralski-grown silicon N81-32056
Effects of magnetic fields on main sequence stars N81-32098
ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Hearing impaired aviators in the U.S. Army N81-31471
ARMY AVIONICS RESEARCH AND DEVELOPMENT ACTIVITY, FORT MONMOUTH, N. J.
Electronic voice communications improvements for Army aircraft N81-31454
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Precipitation and inactivation of phosphorus as a lake restoration technique [PB81-196511] N81-31617
ARMY RESEARCH AND DEVELOPMENT GROUP (EUROPE), FPO NEW YORK 09510.
The 4th International Workshop on Rare-Cobalt Permanent Magnets and their Application [PB81-196024] N81-31955
ASTRO RESEARCH CORP., CARPINTERIA, CALIF.
Considerations in the design of large space structures [NASA-CR-165744] N81-31271
ATMOSPHERIC AND ENVIRONMENTAL RESEARCH, INC., CAMBRIDGE, MASS.
Solar luminosity variation on directly observable time scales: observational evidence and basic mechanisms N81-31769
AUBURN UNIV., ALA.
Role of non-ferrous coal minerals and by-product metallic wastes in coal liquefaction [DOE/ET-14806/T4] N81-31391
AVCO-EVERETT RESEARCH LAB., MASS.
Conceptual design study of potential early commercial MHD powerplant. Report of task 2 results [NASA-CR-165235] N81-31632
AVCO SYSTEMS DIV., WILMINGTON, MASS.
Toward optimization of the woven flywheel [UCRL-15359] N81-31294

B

BABCOCK AND WILCOX CO., LYNCHBURG, VA.
Defect characterization by acoustic holography. Volume 2: Effects of cladding on AH imaging and test-block results [EPRI-NP-1534-VOL-2] N81-31530
BARTON-ASCHMANN ASSOCIATION, INC., EVANSTON, ILL.
Overview of energy-conserving development planning and design techniques based on five case studies [ANL/CNSV-TM-59] N81-31644
BATTELLE COLUMBUS LABS., OHIO.
Operation of the Metals and Ceramics Information Center [AD-A102212] N81-31371
Evaluation of emissions and control technology for industrial stoker boilers [PB81-197873] N81-31696
BATTELLE INST., FRANKFURT AM MAIN (WEST GERMANY).
Demonstration of the separation behavior of alloys using transparent model systems N81-31253
Self discharge of cells with negative electrodes in lithium or lithium alloys [BMFT-FB-T-80-031] N81-31671
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Some aspects of fluctuating vertical wind shears [PNL-3771] N81-31792
BAYER A.G., DORMAGEN (WEST GERMANY).
Development of an autonomous experiment on the measurement of friction losses of pneumatic transport under reduced gravity N81-31246
BELL TELEPHONE LABS., INC., WHIPPANY, N. J.
An algebraic approach to data-adaptive array processing [AD-A101872] N81-31438
BENDIX CORP., BALTIMORE, MD.
Detection instrumentation for cable shield defects [PB81-194540] N81-31496
BENDIX CORP., KANSAS CITY, MO.
DC sputter gold deposition on beryllium-copper contacts [BDX-613-2629] N81-31348
Tester line voltage monitor [BDX-613-2449] N81-31531
Progress in the battle with the burr [BDX-613-2306] N81-31552
Electrochemical deburring [BDX-613-2594] N81-31553
Development of fracture toughness measurement capability by ultrasound [BDX-613-2625] N81-31586
BIOTECHNOLOGY, INC., FALLS CHURCH, VA.
A flight investigation of simulated data-link communications during single-pilot IFR flight. Volume 1: Experimental design and initial test [NASA-CR-3461-VOL-1] N81-31171
BODENSEEWERK GERAETETECHNIK G.M.B.H., UEBERLINGEN (WEST GERMANY).
Identification and determination of strapdown error-parameters by laboratory testing N81-31179
BOEING AEROSPACE CO., SEATTLE, WASH.
Fillers for improved graphite fiber retention by polymer matrix composites [NASA-CR-165437] N81-31288
BOEING CO., SEATTLE, WASH.
Waverly Homes, Inc. (lot 13) single family residence, Westminster, Colorado. Solar project description [SOLAR/1022-81/50] N81-31666
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Comments on Reynolds number effects and the role of NTF in the development of air vehicles N81-31142
The nature of operating flight loads and their effect on propulsion system structures N81-31207
Graphite reinforced thermoplastic composites [AD-A102217] N81-31292
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Flight simulator: Use of spacegraph display in an instructor/operator station [AD-A101951] N81-31235
Design of the CSIN (Chemical Substances Information Network) User Services Office [PB81-196362] N81-32080
BOSTON UNIV., MASS.
Computer simulation techniques for artificial modification of the ionosphere [AD-A102302] N81-31722
BOWIE STATE COLL., MD.
Characterization of the physico-chemical properties of polymeric materials for aerospace flight [NASA-CR-160070] N81-31362
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Investigation of sulfur-tolerant catalysts for selective synthesis of hydrocarbon liquids from coal-derived gases [DOE/ET-14809/6] N81-31322
BRITISH BROADCASTING CORP., KINGSWOOD (ENGLAND).
Satellite broadcasting: An experimental transmission of television with digital stereophonic sound [BBC-RD-1981/3] N81-31411
BRITISH LIBRARY LENDING DIV., BOSTON SPA (ENGLAND).
Safety locking device between sealed vessels [BLL-RISLEY-4270-(9091.9F)] N81-31545
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Storage in residential solar total-energy systems [BNL-51230] N81-31658
District heating: Air-quality considerations and the Clean Air Act [BNL-51361] N81-31683
Dynamics of the atmospheric boundary layer during the 1980 total solar eclipse [BNL-29497] N81-31729
BROWN, BOVERI UND CIE, A.G., HEIDELBERG (WEST GERMANY).
Porosity of welds N81-31255
Exhaust sensor for heating systems [BMFT-FB-T-80-054] N81-31326
BROWN UNIV., PROVIDENCE, R. I.
Combined macroscopic and microscopic approach to the fracture of metals [DOE/ER-10556/85] N81-31346
Almost sure convergence of adaptive identification prediction and control algorithms [AD-A102041] N81-31905
BUNDESMINISTERIUM FUER FORSCHUNG UND TECHNOLOGIE, BONN (WEST GERMANY).
Current problems in the German program on materials research and processing technology in space N81-31242
BUREAU OF MINES, ALBANY, OREG.
Electric-arc furnace processing of domestic titaniferous materials [PB81-196727] N81-31354
BUREAU OF MINES, PITTSBURGH, PA.
Direct method determination of the gas content of coal: Procedures and results [PB81-196735] N81-31401
BUREAU OF MINES, TWIN CITIES, MINN.
Selective extraction of metals from Pacific Sea nodules with dissolved sulfur dioxide [PB81-197139] N81-31356
Method for preparing ferrochromium alloys by vacuum reduction and simple melting of reduced products [PB81-197196] N81-31357

BUREAU OF RADIOLOGICAL HEALTH, ROCKVILLE, MD.
An evaluation of radiation emission from video display terminals
[PB81-198483] N81-31826

BUSINESS AND TECHNOLOGICAL SYSTEMS, INC., SEABROOK, MD.
LAMMR world data base documentation support and demonstrations
[NASA-CR-166706] N81-32073

C

CAL RECOVERY SYSTEMS, INC., RICHMOND, CALIF.
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089

CALIFORNIA DEPT. OF CONSERVATION, SACRAMENTO.
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[DOE/ET-27035/T1] N81-31609

CALIFORNIA INST. OF TECH., PASADENA.
A study of the time dependence in fracture processes relating to service life prediction of adhesive joints and advance composites
[AD-A102367] N81-31581
High spectral resolution observations of the molecular hydrogen emission in the Orion molecular cloud N81-32099
A balloon measurement of the isotopic composition of galactic cosmic ray boron, carbon, and nitrogen N81-32113

CALIFORNIA UNIV., BERKELEY.
Interactive optimal design of dynamically loaded structures
[PB81-195679] N81-31410
Applications of Rayleigh scattering to turbulent flows with heat transfer and combustion
[AD-A102176] N81-31510
Analysis of local variations in tree field seismic ground motion N81-31709
Effects of the Cosmos 1129 Soviet paste diet on body composition in the growing rat
[NASA-CR-164725] N81-31810
The design methodology of distributed computer systems
[AD-A102065] N81-31864
Multi-server queues
[AD-A101851] N81-31906

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Radiation biophysics research
[LBL-11700] N81-31811
Study of rare processes induced by 209-Gev muons
[LBL-12789] N81-31966

CALIFORNIA UNIV., DAVIS.
Chemical and mineralogical composition and behavior of the Mancos shale as a diffuse source of salts in the upper Colorado River Basin
[PB81-197626] N81-31737

CALIFORNIA UNIV., IRVINE.
The 11th Conference on Environmental Toxicology
[AD-A102259] N81-31681

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Flame propagation in gaseous fuel mixtures in semiconfined geometries
[UCID-19000] N81-31324
Ambipolar potential formation in TMX
[UCRL-85828-REV-1] N81-31486
Automatic test system for CCDS
[UCID-19077] N81-31489
Simulation of three-dimensional, time-dependent, incompressible flows by a finite element method
[UCRL-85226] N81-31517
Pulsed-laser heating: A tool for studying degradation of materials subjected to repeated high temperature excursions
[UCRL-53074] N81-31542
Hierarchical set of models for estimating the effects of air pollution on vegetation
[UCRL-85367] N81-31682
Ozone depletion calculations
[UCRL-85814] N81-31730
Facility management of computer-aided Design, Drafting/Manufacturing systems (CADD/M)
[UCRL-84959] N81-31895
Neutral-beam injectors for 1990 and 2005
[UCRL-53112] N81-31978
Thresholds and Q values of nuclear reactions induced by neutrons, protons, deuterons, tritons He-3 ions, alpha particles, and photons, volume 24
[UCRL-50400-VOL-24] N81-31979
Study of the equilibrium and decay of compact toroids generated by a magnetized co-axial plasma gun
[UCRL-85912] N81-32036
Plastic dislocation motion via nonequilibrium molecular and continuum dynamics
[UCRL-84146] N81-32068

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Neuronal adaptive mechanisms underlying intelligent information processing
[AD-A101908] N81-31843

CALIFORNIA UNIV., SAN DIEGO.
Structural chemistry of the marine manganate minerals N81-31714
Carbon and hydrogen gases in hydrothermal systems: The search for a mantle source N81-31715

CALIFORNIA UNIV. AT SAN DIEGO, LA JOLLA.
Solar activity, cosmic ray produced carbon-14 and the terrestrial climate N81-31771
Space Telescope digicon technology
[NASA-CR-166704] N81-32096

CALMAC MFG. CO., ENGLEWOOD, N. J.
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[DOE/CS-34698/T1] N81-31669

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[AD-A102286] N81-31314

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[NRC/CNR-TT-1983] N81-31747

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Kinetics of grain boundary migration in dilute copper-silicon bicrystals N81-32052

CASE INST. OF TECH., CLEVELAND, OHIO.
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[AD-A102042] N81-31512
Preliminary experimental study of disturbances in a laminar boundary-layer due to distributed surface roughness
[AD-A102072] N81-31513

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[DOE/TIC-1022359] N81-31646
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Working group 1: Statistical methods N81-31778

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[CTH-MATH-1981-1] N81-31950

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[DOE/CS-10046/2-VOL-1] N81-31660
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[AD-A102091] N81-31273
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[GPO-67-017] N81-32083
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[GPO-76-079] N81-31382
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[AD-A102333] N81-31723
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[NASA-CR-164733] N81-32086
DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.
Crop area estimates using ground-gathered and LANDSAT data. A multitemporal approach: Missouri, 1979
[PB81-186751] N81-31614
DEPARTMENT OF ENERGY, BARTLESVILLE, OKLA.
Polyacrylamide polymer viscosity as a function of brine composition
[DOE/BETC/RI-80/12] N81-31373
DEPARTMENT OF TRANSPORTATION, WASHINGTON, D. C.
A review of The Department of Transportation regulations for transportation of radioactive materials, revised 1980 N81-31161
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BONN (WEST GERMANY).
On the application of a TV-multipoint x-y tracker to the measurement of the transmissibility of human vibration N81-31846
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY).
Determination of aircraft dynamic stability and control parameters from flight testing N81-31115
Unsteady thermal stress analysis of a cryogenic foam insulation element
[DFVLR-FB-81-17] N81-31378
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Projects and plans of the German program on materials research and processing technology in space N81-31243
Multiple purpose facilities for materials science experiments in space N81-31251
Scientific report of the Research Department for Fluid Dynamics N81-31520
Activities report on aerospace and energy research N81-31672
Modes of operation of the Space Optics Laboratory N81-31998
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, GOETTINGEN (WEST GERMANY).
Unsteady airloads on oscillating wings in post-stall condition
[DFVLR-FB-81-16] N81-31158
Aeroelastic buffeting prediction techniques: A general review
[DFVLR-FB-81-15] N81-31226
Marangoni convection in a rotating melting zone N81-31264
Flow phenomena in a floating zone and feasibility of their investigation by means of the Space optics Laboratory N81-32000
Influence of transverse magnetic fields N81-32004
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, PORZ (WEST GERMANY).
Space experiments on dissipative structures N81-32005
DEUTSCHE GESELLSCHAFT FUER LUFT- UND RAUMFAHRT, COLOGNE (WEST GERMANY).
Spacelab utilization: Materials research and processing technology in space
[DGLR-80-02] N81-31241
DEUTSCHE GESELLSCHAFT FUER MINERALOELWISSENSCHAFT UND KOHLECHEMIE E.V., HAMBURG (WEST GERMANY).
Air uptake and air release behavior of lubricating oils and hydraulic fluids
[DGMK-31] N81-31376
DEUTSCHES GEODAETISCHES FORSCHUNGSINSTITUT, MUNICH (WEST GERMANY).
Tidal tilt measurements at the Schiltach Geophysical Laboratory
[SER-B-245] N81-31733
On the numerical analysis of the weight optimization of geodetic nets
[SER-C-256] N81-31734
DOUGLAS AIRCRAFT CO., INC., LONG BEACH, CALIF.
Preliminary user planning for the NASA National Transonic Facility N81-31145
DREXEL UNIV., PHILADELPHIA, PA.
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659
DSM/NV NEDERLANDSE STAATSMIJNEN, GELEEN.
Measurement of thermodynamic quantities of polymer systems
[MS-1240] N81-31377
DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S.C.
Dispersion of radioactive pollutant in a tornadic storm
[DP-1556] N81-31687
Environmental analysis burial of offsite low-level waste at SRP
[DPST-80-466] N81-31982
DYNATECH R/D CO., CAMBRIDGE, MASS.
Engineering economic analysis of biomethanation of pyrolysis gas
[DOE/CE-20098/1] N81-31394

E

EAGLE-PICHER INDUSTRIES, INC., SENECA, MO.
Development of a maintenance-free 100 ampere-hour lead-acid battery for deep discharge photovoltaic applications
[SAND-81-7120C] N81-31641

EAST ANGLIA UNIV., NORWICH (ENGLAND).
Climatic trends at high northern latitudes during the last 4,000 years compared with carbon 14 fluctuations N81-31750
ECOSOMETRICS, INC., BETHESDA, MD.
Wisconsin manual to coordinate elderly and handicapped transportation services in rural and small urban counties
[PB81-197865] N81-32091
EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.
Development of geothermally assisted process for production of liquid fuels and chemicals from wheat straw
[DOE/ID-12051/T1] N81-31393
Small hydro plant development program
[DOE/ID-01570/T21-VOL-2-APP-A-K] N81-31652
EDGERTON, GERMESHAUSEN AND GRIER, INC., LAS VEGAS, NEV.
Oscillator monitor
[EGG-1183-1802] N81-31532
EG & G WASHINGTON ANALYTICAL SERVICES CENTER, INC., RIVERDALE, MD.
Prototype microprocessor controller
[NASA-CR-166703] N81-31861
EHRENKRANTZ GROUP, NEW YORK, N. Y.
Identification of product and material differences in active solar systems
[ANL-K-81-74] N81-31653
EIDGENOESSISCHE TECHNISCHE HOCHSCHULE, ZURICH (SWITZERLAND).
Gas bubble formation in electrolytes under reduced gravity N81-31249
ELECTRONIC VISION CORP., SAN DIEGO, CALIF.
Space Telescope digicon technology
[NASA-CR-166704] N81-32096
ELECTRONICS RESEARCH LAB., ADELAIDE (AUSTRALIA).
A universal solid ion source
[AD-A102321] N81-32063
ELOGIC, INC., HOUSTON, TEX.
Improved version of the split routine for CLASSY
[E81-10210] N81-31600
EMCON ASSOCIATES, SAN JOSE, CALIF.
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
ENVIRONMENTAL PROTECTION AGENCY, CHICAGO, ILL.
Lake Michigan intensive survey 1976-1977
[PB81-196636] N81-31618
ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
Guideline for applying the the Airshed Model to urban areas
[PB81-200529] N81-31699
Guideline for fluid modeling of atmospheric diffusion
[PB81-201410] N81-31739
Dependence of nephelometer scattering coefficients on relative humidity, evolution of aerosol bursts
[PB81-198293] N81-31797
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Controlling sulfur oxides
[PB81-200800] N81-31700
ENVIRONMENTAL SCIENCES RESEARCH LAB., RESEARCH TRIANGLE PARK, N.C.
Filter media for collecting diesel particulate matter
[PB81-197774] N81-31695
ERLANGEN-NUREMBERG UNIV. (WEST GERMANY).
Results of experiments on directional solidification of the InSb-NiSb eutectic in the gradient heating facility of CNES, Toulouse. Draft of a characterizing program for eutectic probes N81-31259
Orientation experiment on the convection in metal melts N81-32002
ERNO RAUMFAHRTTECHNIK G.M.B.H., BREMEN (WEST GERMANY).
Storage of fluids and fuels in large tanks under zero gravity N81-32007
EXXON RESEARCH AND ENGINEERING CO., FLORHAM PARK, N.J
EDS coal liquefaction process development, phase 4. Construction of Exxon coal liquefaction pilot plant
[DOE/ET-10069/T4] N81-31389

F

FALCON RESEARCH AND DEVELOPMENT CO., BUFFALO, N. Y.
Dynamometer and track measurement of passenger car fuel economy
[PB81-196446] N81-32092
FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
NAS automation equipment operating cost estimates, FY 1978 - 1979
[AD-A102023] N81-31182
Airport activity statistics of certificated route air carriers
[AD-A102355] N81-31236
Improved weather services for helicopter operations in the Gulf of Mexico
[AD-A102209] N81-31786
Dissemination of weather information in the air traffic control system
[AD-A102027] N81-31787
FEDERAL AVIATION AGENCY, ATLANTIC CITY, N.J.
Active beacon collision avoidance logic evaluation. Volume 1: Mode C equipped (ATCRBS) threat phase
[AD-A102163] N81-31181
FEDERAL COMMUNICATIONS COMMISSION, WASHINGTON, D. C.
The role of an electromagnetic environment model in spectrum management
[PB81-194672] N81-31448
FEDERAL HIGHWAY ADMINISTRATION, AUSTIN, TEX.
Summary and recommendations for the implementation of rigid pavement design, construction and rehabilitation techniques
[PB81-200578] N81-31409
FEDERAL HIGHWAY ADMINISTRATION, INDIANAPOLIS, IND.
The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry
[PB81-200073] N81-31408
FERMI NATIONAL ACCELERATOR LAB., BATAVIA, ILL.
Fixed points: Fermion mass predictions
[FERMILAB-CONF-81/44-THY] N81-31962
Quark-antiquark potential and quantum chromodynamics
[FERMILAB-CONF-81/38-THY] N81-31969
FERNMELDETECHNISCHES ZENTRALAMT, DARMSTADT (WEST GERMANY).
Scattering and absorption of electromagnetic waves by spheroidal raindrops
[REPT-455-TBR-67] N81-31441
Space diversity experiments on a 20 kilometer long 15 GHz link
[REPT-455-TBR-70] N81-31442
Applications of periodic integrated optical structures in communication circuits
[REPT-465-TBR-20.] N81-32019
FLORIDA UNIV., GAINESVILLE.
Laser excited fluorescence as a plasma probe: Stochastic interpretations of preliminary experimental observations N81-31303
The analysis and design of shock absorbers with constant deceleration for variable loading N81-31548
Monte Carlo calculation of the Born-Oppenheimer potential between two helium atoms N81-31960
An LCAO local density functional approach to surface electronic structure calculations N81-32048
Electrochromism in thin films of tungsten trioxide and neodymium-doped tungsten trioxide N81-32053
Metallic hydrogen: A two-body approach to band theory and a quantum mechanical test of Diophantine methods N81-32055
Thermodynamics and statistical mechanics of systems of reactive components with applications to strong electrolytes N81-32070
FONDAZIONE UGO BORDONI, ROME (ITALY).
Prediction of rain intensity simultaneity for the optimization of multibeam satellite communication systems
[FUB-1-1980] N81-31445
Recognition test for an open set of talkers represented by their acoustic parameters
[FUB-2-1981] N81-31446
Coexistence of one or more frequency shift keying modulation numerical channels with frequency division multiplexing-frequency modulation networks at 4, 6 and 7 GHz
[FUB-4-1981] N81-31447
The utilization of microprocessors in real time numerical signal processing
[FUB-49-1979] N81-31870
Representation of Walsh discrete functions of the input-output equation for pseudolinear systems
[FUB-3-1981] N81-31920
Modal noise in optical fibers and signal fluctuations in an underground laid optical cable
[FUB-44-1980] N81-32010
Modal noise in optical fibers N81-32011
Signal fluctuations in an underground laid optical cable N81-32012
FREIBURG UNIV. (WEST GERMANY).
Solvent zone crystallization of CdTe in a mirror heating facility N81-31256
Construction and test of a mono-ellipsoid mirror heating facility N81-31258
Biochemical preparatory and analytical developments and plans in connection with the Spacelab programs N81-31261
Growth of silicon crystals N81-32008
Protein crystal growth under space conditions N81-32009
FREIE UNIV., BERLIN (WEST GERMANY).
Meteorological data. Volume 2, number 2: Synoptic stratopause method for computation of temperature profiles from satellite measurements of the infrared radiation during winter warmings, series A monographs
[ISSN-0342-4324] N81-31740
Meteorological data. Volume 3, number 3: Spectral analysis of geopotential along lattitude 50 N for summer and winter, series A monographs
[ISSN-0342-4324] N81-31741
Meteorological data. Volume 3, number 4: Comparative investigation between the climate prevailing during the full 24-hour day and that during the nine-hour working day (7 a.m. - 4 p.m.) in Berlin, series A monographs
[ISSN-0342-4324] N81-31742

G

GALILEO ELECTRO-OPTICS CORP., STURBRIDGE, MASS.
Infinite gamma device program
[NASA-CR-166707] N81-31476
GARRETT CORP., TORRANCE, CALIF.
Adaptive reference voltage generator for firing angle control of line-commutated inverters
[NASA-CASE-MFS-25215-1] N81-31481
GAS RECOVERY SYSTEMS, INC., PASADENA, CALIF.
Feasibility study: Utilization of landfill gas for a vehicle fuel system, Rossman's landfill, Clackamus County, Oregon
[DOE/RA-50366/T1] N81-32089
GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Simplified plotting package for the LSI-11 computer and Tektronix terminals
[GA-A-16148] N81-31896
Doppler ion program description
[GA-A-16140] N81-31973
GENERAL ELECTRIC CO., CINCINNATI, OHIO.
Structures performance, benefit, cost-study
[NASA-CR-165456] N81-31194
CF6-50 engine emissions testing with traverse probe
[AD-A102159] N81-31218
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
The 30/20 GHz demonstration system SSUS-D/BSE
[NASA-CR-165454] N81-31419
Solar central receiver heliostat mirror module development
[SAND-79-8189] N81-31656
GENERAL ELECTRIC CO., SCHENECTADY, N. Y.
CF 6 engine diagnostics N81-31197
CF6 high pressure compressor and turbine clearance evaluations N81-31198
Advanced turbine blade tip seal system N81-31205
Engine condition monitoring: CF6 family 60's through the 80's N81-31215

Engine health monitoring: An advanced system N81-31216

GENERAL ELECTRIC CO., ST. PETERSBURG, FLA.
Thermal diffusivities of molybdenum/alumina cermets
[GEPP-TIS-472] N81-31375
In-mine testing of a natural background sensor, part B
[NASA-CR-161847] N81-31602

GENERAL RESEARCH CORP., SANTA BARBARA, CALIF.
FAVS enhancements
[AD-A102218] N81-31883

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Geohydrology of the Delta-Clearwater Alaska
[PB81-200651] N81-31621

GEOLOGICAL SURVEY, TOWSON, MD.
Water resources data for Maryland and Delaware, water year 1980
[PB81-195885] N81-31616

GEORGETOWN UNIV., WASHINGTON, D.C.
Theory of quasiparticle tunneling between dissimilar superconductors N81-32050

GEORGIA INST. OF TECH., ATLANTA.
HF/UHF low-loss nanosecond variable delay lines
[AD-A102271] N81-31431

GEOSCIENCE RESEARCH CORP., SALISBURY, MD.
Terrain profiling from Seasat altimetry
[NASA-CR-156878] N81-31604
Ice sheet altimetry
[NASA-CR-156877] N81-31605

GIESSEN UNIV. (WEST GERMANY).
Convection in a floating zone without rotation N81-31263
Special problems encountered in the optical measurement of Marangoni-convection flow fields N81-32001

GOULD, INC., GLEN BURNIE, MD.
Table of the modified Bessel functions of orders zero and one together with the function phi(z)=(21sub1)(z)/(zlsub0)(z) and its reciprocal for complex argument
[AD-A102444] N81-31912

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Hybridized polymer matrix composites
[NASA-CR-165339] N81-31361

H

HAMILTON STANDARD, FARMINGTON, CONN.
Hamilton Standard Superjet solid state fluidic rate sensor N81-31176

HARDING COLL., SEARCY, ARK.
K-line iterative methods: A conjugate-gradient approach
[LA-UR-81-1409] N81-31916

HARVARD UNIV., CAMBRIDGE, MASS.
The changing atmosphere: Its role in climate N81-31776

HONEYWELL ELECTRO-OPTICS CENTER, LEXINGTON, MASS.
Thermal infrared array, phase 1. Volume 1: Technical
[NASA-CR-166705] N81-31991

HONEYWELL SYSTEMS AND RESEARCH CENTER, MINNEAPOLIS, MINN.
Inertial system alignment and calibration on a moving base N81-31178

HOUSTON UNIV., TEX.
Research on numerical algorithms for large space structures
[NASA-CR-164721] N81-31911

HUGHES AIRCRAFT CO., FULLERTON, CALIF.
Electrical characterization of microprocessor memories
[AD-A102305] N81-31862

HUGHES RESEARCH LABS., MALIBU, CALIF.
High-speed GaAs MESFET memory study
[AD-A102252] N81-31863

HUMAN ENGINEERING LABS., ABERDEEN PROVING GROUND, MD.
The background and bases for the proposed military standard on acoustical noise limits in helicopters N81-31459

I

IBM RESEARCH LAB., SAN JOSE, CALIF.
The reaction of HF with polyacetylene
[AD-A102293] N81-31310
Poly (p-Phenylene Sulfide) hexafluoroarsenate: A novel conducting polymer
[AD-A102290] N81-31367
Electrical properties of pyrrole and its copolymers
[AD-A102292] N81-31368
Photoinitiated doping of polyacetylene
[AD-A102291] N81-31369

ILLINOIS INST. OF TECH., CHICAGO.
Nonlinear free surface convection in a bounded cylindrical geometry N81-31503
The cost effectiveness of minicomputers versus man frames for structural analysis problems, part 1
[AD-A102265] N81-31865
Cost/performance comparisons for programs on different machines, part 2
[AD-A102266] N81-31866

ILLINOIS UNIV. AT CHICAGO CIRCLE, CHICAGO.
Mode theory for an equilateral triangular dielectric waveguide N81-31478
The continuous damage theory of brittle materials and its applications in plane problems N81-31575

ILLINOIS UNIV. AT URBANA.
Nuclear magnetic resonance of platinum catalysts: The discovery of the surface resonance N81-32045
An electron tunneling investigation of the effects of hydrogen and deuterium impurities on the superconducting properties of lead and indium N81-32047

ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
Adhesion, residual stresses and tribology of RF sputter deposited titanium carbide coatings N81-31287
Oxygen diffusion in vanadium-based alloys N81-31338
Shock development and transition to detonation initiated by burning in porous propellant beds
[AD-A102030] N81-31386
Study of antenna radome problems
[AD-A102205] N81-31432
A stress analysis of circular cylindrical shell intersections, including the influences of reinforcement, cyclical plasticity and fatigue N81-31566
Dynamic response of tuned secondary systems N81-31567
Evolutionary structure and search N81-31860
Phase transitions in disordered systems. 1: Exciton/electron-hole liquid/plasma system in germanium. 2: Amorphous ferromagnets and spin glasses N81-32054
Electronic structure of solids and their surfaces and interfaces
[AD-A101945] N81-32062

ILLINOIS UNIV., CHICAGO.
On solving the large sparse generalized eigenvalue problem N81-31859
Query processing in a distributed database N81-32072

ILLINOIS UNIV., URBANA.
Delayed failure characteristics of plasma-sprayed aluminum oxide applied to stainless steel and titanium alloy substrates in various physiological media N81-31332
Electronic phenomena at high pressure
[DOE/ER-01198/1350] N81-31488
Stress-assisted diffusion and consolidation with double porosity N81-31561
Pilot interaction with automated airborne decision making systems
[NASA-CR-164729] N81-31847
Evaluation of natural language processors N81-31858
Particle-confinement criteria for axisymmetric field-reversed magnetic configurations
[CONF-810450-1] N81-31977
Confinement requirements for ohmic-compressive ignition of a Spheromak plasma
[CONF-810606-33] N81-32030
Plasma ion heating and energy loss from alpha-particle micro- instabilities
[CONF-810606-34] N81-32031

INDIANA STATE HIGHWAY COMMISSION, INDIANAPOLIS.
The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry
[PB81-200073] N81-31408

INGENIEURBUERO, BRUEHL (WEST GERMANY).
Solar energy model Goennebek. Development and planning of a self-supporting heating plant for greenhouses
[BMFT-FB-T-80-119] N81-31673

INSTITUT D'AERONOMIE SPATIALE DE BELGIQUE, BRUSSELS.
Life and death of artificial satellites
[AERONOMICA-ACTA-A-228-1981] N81-31269
Fluctuations, solar periodicities, and climatic transitions N81-31777

INSTITUT FRANCO-ALLEMAND DE RECHERCHES, ST. LOUIS (FRANCE).
Introduction to interferometry N81-31994

INSTITUTE FOR PERCEPTION RVO-TNO, SOESTERBERG (NETHERLANDS).
The effect of noise-induced hearing loss on the intelligibility of speech in noise N81-31460
STI: An objective measure for the performance of voice communication systems N81-31465
Some applications of the STI-method in evaluating speech transmission channels N81-31466

INSTITUTE FOR TELECOMMUNICATION SCIENCES, BOULDER, COLO.
Analysis of a phase-locked loop to suppress interference from a solar power satellite
[PB81-193781] N81-31675
Analysis of interference caused by the Solar Power Satellite to satellite earth terminals
[PB81-194268] N81-31676
Analysis of interference from the Solar Power Satellite to general electronics systems
[PB81-194250] N81-31677

INSTITUTE OF AVIATION MEDICINE, OSLO (NORWAY).
Second language speech comprehension in noise: A hazard to aviation safety N81-31463

INSTITUUT TNO VOOR WISKUNDE, INFORMATIEVERWERKING EN STATISTIEK, THE HAGUE (NETHERLANDS).
The first four moments of a distribution
[IWIS-TNO-A-79-ST-66-36] N81-31951
The development and application of a disaggregate Poisson model for trip generation
[IWIS-A-80-VK-01-01] N81-32090

INTERNATIONAL NICKEL CO., INC., SUFFERN, N.Y.
Availability of critical scrap metals containing chromium in the United States. Superalloys and cast heat- and corrosion-resistant alloys
[PB81-197147] N81-31355

IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
Trace organics removal using activated carbon and polymeric adsorbents
[PB81-196784] N81-31693

IOWA UNIV., IOWA CITY.
An algorithm for isotonic regression in the plane
[AD-A102559] N81-31935
Order restricted statistical tests on multinomial and Poisson parameters: The starshaped restriction
[AD-A102562] N81-31936

J

JACOBS ENGINEERING CO., PASADENA, CALIF.
Environmental perspective on the emerging oil shale industry. Volume 2: Appendices
[PB81-196602] N81-31691

JAYCOR, ALEXANDRIA, VA.
Experimental studies of autoacceleration concepts
[AD-A101913] N81-31976

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Hydrodynamic stability of thin films N81-31505
The electrical conductivity of the Earth's upper mantle as estimated from satellite measured magnetic field variations N81-31708
Optimal point process estimators for Gaussian optical field intensities N81-31989
Recoilless Rayleigh scattering from pure single crystals of Barium titanate near the 130 deg C ferroelectric Curie point N81-32051

JOINT ECONOMIC COMMITTEE (U. S. CONGRESS).
Energy conservation: Emerging consensus, diverging commitment
[GPO-72-109] N81-31635

K

KAISER ENGINEERS, OAKLAND, CALIF.
Industrial utilization of waste derived energy
[DOE/CE-20030/1] N81-31643
KANAGAWA UNIV., YOKAHAMA (JAPAN).
Quasi-biennal oscillation of solar activity and its control of the Earth's climate N81-31761
KANSAS DEPT. OF TRANSPORTATION, TOPEKA.
Study of D-cracking in portland cement concrete pavements. Volume 2: Laboratory phase
[PB81-200081] N81-31590
KARLSRUHE UNIV. (WEST GERMANY).
Process chamber: Heat conduction, diffusion, convection, reaction kinetics, surfaces and wettability under reduced gravity N81-31262
Research program of the Special Research Division 80, 1981 to 1983
[KU-SFB-80/A/166] N81-31521
Optics workshop: View of the applications of the Space Optics Laboratory, Aug. 1979
[BMFT-FB-W-79-44] N81-31993
Laser Doppler anemometry and its application to flow measurements N81-31995
The Space Optics Laboratory N81-31996
Application of the Space Optics Laboratory in the specific case of Benard cell convection N81-31997
Cell convection of reduced gravity N81-32003
KENT STATE UNIV., OHIO.
Precipitation and inactivation of phosphorus as a lake restoration technique
[PB81-196511] N81-31617
Covering bottom sediments as a lake restoration technique
[PB81-200453] N81-31620
KENTRON INTERNATIONAL, INC., HAMPTON, VA.
Design and analysis of a fuel-efficient single-engine, turboprop-powered, business airplane
[NASA-CR-165768] N81-31184
KENTUCKY UNIV., LEXINGTON.
Electron photoejection in carbanions
[DOE/ER-10424/1] N81-31975
KLM ROYAL DUTCH AIRLINES, AMSTERDAM (NETHERLANDS).
Review of AIDS development N81-31212
KRUPP (FRIED.) G.M.B.H., ESSEN (WEST GERMANY).
Trapping of discrete phases at solidification fronts N81-31252

L

LABORATOIRE DE GEOPHYSIQUE EXTERNE DU C.N.R.S., ST. MAUR-DES-FOSSES (FRANCE).
The magnetosphere, interface between the Sun and the lower atmosphere N81-31763
LEHIGH UNIV., BETHLEHEM, PA.
Theoretical and experimental investigation of coherent structure in the turbulent boundary layer
[AD-A102368] N81-31511
LIBRARY OF CONGRESS, WASHINGTON, D. C.
United States and Soviet progress in space: Summary data through 1979 and a forward look
[GPO-59-476] N81-31240
Synfuels from coal and the national synfuels production program: Technical, environmental, and economic aspects
[GPO-71-047] N81-31385
Energy from biomass and solid wastes: Prospects and constraints
[GPO-62-872] N81-31636
How to investigate the copyright status of a work
[CIRCULAR-R22] N81-32084
LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Finite-sum expressions for signal detection probabilities
[AD-A102143] N81-31433
Advanced electronic technology
[AD-A102144] N81-31484
Analysis and test of line-commutated inverters for use in photovoltaic power systems
[DOE/ET-20279/115] N81-31491
Analysis of an electro-optical satellite observation
[AD-A102514] N81-32014
LITTON SYSTEMS, INC., WOODLAND HILLS, CALIF.
A nuclear magnetic resonance gyro using noble gas isotopes N81-31175
LOCKHEED ENGINEERING AND MANAGEMENT SERVICES CO., INC., HOUSTON, TEX.
Meteorological satellite data: A tool to describe the health of the world's agriculture
[E81-10204] N81-31596
A description of the reformatted spring small grains labeling procedure used in test 2, part 2 of the US/Canada wheat and barley exploratory experiment
[E81-10206] N81-31597
Classification of wheat: Badhwar profile similarity technique
[E81-10207] N81-31598
Weather analysis and interpretation procedures developed for the US/Canada wheat and barley exploratory experiment
[E81-10208] N81-31599
User's guide for CCT2WA (converting CCT's to work-addressable file)
[NASA-CR-161076] N81-31882
LOCKHEED-GEORGIA CO., MARIETTA.
Development of an orthotropic hole element
[NASA-CR-165759] N81-31580
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
Development of coatings for corrosion/erosion protection of internal components of coal gasification vessels. Volume 1: Laser fused MCrAl coatings
[DOE/ET-10245/1-VOL-1] N81-31350
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[DOE/ET-10245/1-VOL-2] N81-31351
Global function approach in structural analysis: Basic approach, numerical results
[NASA-CR-165669] N81-31579
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
Support interference N81-31113
Aeroelasticity, including dynamic effects of separated flow N81-31118
Thermal expansion properties of composite materials
[NASA-CR-165632] N81-31576
Ocean thermal energy conversion power system development-2, phase 2
[DOE/ET-21056/T3] N81-31651
LOCKMAN AND ASSOCIATES, MONTEREY PARK, CALIF.
Feasibility of direct on-site conversion of landfill gas to electrical energy at Scholl Canyon landfill, California
[DOE/CE-20237/1] N81-31667
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Hot dry rock geothermal potential of Roosevelt Hot Springs area: Review of data and recommendations
[LA-8751-HDR] N81-31611
Evaluation of some geophysical events on 22 September 1979
[LA-8672] N81-31728
Bulk-memory processor for data acquisition
[LA-UR-81-1568] N81-31869
Event-analysis language for high-speed data acqusition
[LA-UR-81-1550] N81-31894
Second-order Particle-In-Cell (PIC) computational method in the one-dimensional variable Eulerian mesh system
[LA-UR-81-318] N81-31915
Los Alamos synchronous orbit data set
[LA-UR-81-1453] N81-31963
Comparison of measured emittance of an h(-) ion beam with a simple theory
[LA-8808-MS] N81-31974
Ultraprecision machining of optics at Los Alamos
[LA-UR-81-1962] N81-32018
Position diagnostics for a magnetic-pinch imploding-cylinder X-ray generator
[LA-UR-81-1442] N81-32029
Development of a 600 kV Marx module for a high-density z-pinch experiment
[LA-UR-81-1584] N81-32033
Parallel-beam correlation technique for measuring density fluctuations in plasmas with strong magnetic shear
[LA-8828-MS] N81-32037
Rocket borne solar eclipse experiment to measure the tempeature structure of the solar corona via Lyman-alpha line profile observations
[LA-UR-81-1247] N81-32110
LOUISIANA DEPT. OF TRANSPORTATION AND DEVELOPMENT, BATON ROUGE.
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[PB81-197394] N81-31407
LOWELL UNIV., MASS.
Reliability of ultrasonic weld interrogation methods, phase 1
[PB81-194177] N81-31560
Analysis and computer studies for magnetostatic surface wave transducers
[AD-A102207] N81-31954

M

MAINZ UNIV. (WEST GERMANY).
Space life sciences N81-31244
MARYLAND UNIV., COLLEGE PARK.
Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487
A higher order theory for the potential flow about thin hydrofoils N81-31502
Plate bending finite element based on the extended field method N81-31573
The design of a high-level coroutine implementation for the production of quality software N81-31873
Word Expert Parsing: A theory of distributed word-based natural language understanding N81-31876
A knowledge-based design environment for digital electronics N81-31880
Analyzing a syntactic family of complexity metrics
[AD-A101920] N81-31890
Cellular architectures: From automata to hardware
[AD-A102059] N81-31907
Edge-based texture measures
[AD-A102060] N81-31908
Shrinkage in principal components with applications to factor analysis N81-31922
On an estimation scheme for Gauss Markov random field models
[AD-A102057] N81-31938
Generalized Blomqvist correlation
[AD-A102058] N81-31939
Matrix isolation spectra and structures of unstable molecules N81-31961
Macroscopic plasma behavior in a high voltage toroidal theta pinch N81-32023
Theory of phase transitions in chemisorbed two-dimensional systems N81-32046
Electron spin resonance in amorphous alloys N81-32057
Oxygen adsorption on metals cooled to liquid helium temperatures N81-32058
MASON AND HANGER-SILAS MASON CO., INC., AMARILLO, TEX.
Computer program for storage and retrieval of thermal-stability data for explosives
[MHSMP-81-29] N81-31395
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
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[NASA-CR-165654] N81-31160
Photoegeneration of reactive organometallic species
[AD-A102069] N81-31286
Fracture and fatigue of bi-materials
[AD-A102344] N81-31293
Methane spectral analysis
[AD-A102300] N81-31316
Photochemistry of surface-confined organometallics: Photochemical release of a surface-confined cobalt carbonyl catalyst
[AD-A102112] N81-31317
Sequential decision rules for failure detection
[NASA-CR-164847] N81-31559
Crushing analysis of rotationally symmetric plastic shells
[AD-A101999] N81-31582
Shape optimization of sheet metal structures against crash
[AD-A102024] N81-31583

General review of the MOSTAS computer code for wind turbines
[NASA-CR-165385] N81-31628
Abstration, inspection and debugging in programming
[AD-A102157] N81-31888
SNIFFER: A system that understands bugs
[AD-A102158] N81-31889
On regulators with a prescribed degree of stability
[NASA-CR-164732] N81-31952

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[MRL-R-811] N81-31546
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Integral-operator analysis of open-boundary dielectric waveguides N81-31414
A theoretical and experimental examination of pulsed 16 mum CO2 transfer chemical lasers N81-31535

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Thermodynamic characterization of low molecular weight materials in the glassy state N81-31306
Detonation characteristics of dust dispersed in air
[AD-A102507] N81-31387
Electromagnetic fields resulting from simple acceleration N81-31413
Two-dimensional simulation of GaAs MESFETS using the finite element method N81-31479
Ductile fracture toughness determined on an energy basis using polycarbonate N81-31563
An algorithm for evaluating the boundary integral equations in planar elasto-plastic bodies N81-31574
Statistical study of precipitating electrons
[NASA-TM-80458] N81-31718
Synchronization: A formal approach N81-31871
An approach to the generation of software life cycle support systems N81-31877
Cursive script word recognition N81-31878
Achromatic coherent optical systems for information processing and holography N81-31986
Laser heating of aluminum exploding wire plasmas N81-32022
Nanosecond CO2 laser interaction with a dense helium Z-pinch plasma N81-32024
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Low-cost epitaxial techniques for solar-cell fabrication
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Mass, heat and momentum transfer to a sphere in a rarefied gas N81-31506
Accelerated life testing and safe dose estimation when there are competing causes of failure N81-31557
Interchange of pollutants between groundwater and and mineral strata as applied to waste chemical dumps and in situ coal gasification sites
[PB81-198335] N81-31697
On multiple comparisons N81-31921
An algorithm for isotonic regression in the plane
[AD-A102559] N81-31935
Order restricted statistical tests on multinomial and Poisson parameters: The starshaped restriction
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Rotary and Magnus balances N81-31111
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[NASA-TP-1875] N81-31162
Dimensions of the information transfer problem N81-31163
Information transfer in the surface component of the system: Problems associated with briefing of relief controllers N81-31164
Information transfer in the surface component of the system: Coordination problems in air traffic control N81-31165
Information transfer between air traffic control and aircraft: Communication problems in flight operations N81-31166
Information transfer within the cockpit: Problems in intracockpit communications N81-31167
Information transfer during contingency operations: Emergency air-ground communications N81-31168
The information transfer problem summary and comments N81-31169
Vehicle concepts and technology requirements for buoyant heavy-lift systems
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Structural variability of the Sun N81-31770

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[NASA-TM-81923] N81-31124

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The National Transonic Facility: Review and status report N81-31131

NTF management considerations N81-31134

Pathfinder model program for the National Transonic Facility N81-31135

Model experience in the Langley 0.3-m transonic cryogenic tunnel N81-31136

Instrumentation systems for the National Transonic Facility N81-31137

Instrumentation for calibration and control of a continuous-flow cryogenic tunnel N81-31138

Onset of condensation effects in cryogenic wind tunnels N81-31139

Flow quality measurements in transonic wind tunnels and planned calibration of the National Transonic Facility N81-31140

Wall interference effects: Status review N81-31141

Report of the panel on fluid dynamics N81-31146

High lift technology N81-31147

Configuration aerodynamics N81-31148

Report of the panel on aeroelasticity and unsteady aerodynamics N81-31149

Report of the wind tunnel/flight correlation panel N81-31150

High Reynolds number research requirements for space vehicle design N81-31151

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[NASA-TM-81800] N81-31227

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Phonological variants in medial stop consonants under simulated operational environments: Implications for voice activated controls in aircraft N81-31452
Clear speech: A strategem for improving radio communications and automatic speech recognition in noise N81-31453

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980
[AD-A102495] N81-31187
High speed multiplex bus protocol study
[AD-A102113] N81-31191

NAVAL AIR SYSTEMS COMMAND, WASHINGTON, D. C.
Statistical review of counting accelerometer data for Navy and Marine fleet aircraft from 1 January 1962 to 31 December 1980
[AD-A102495] N81-31187
High speed multiplex bus protocol study
[AD-A102113] N81-31191

NAVAL AVIONICS CENTER, INDIANAPOLIS, IND.
A multiplexed digital voice intercommunications system compatible with future voice conversion techniques N81-31474

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
Investigation of parameters affecting voice recognition systems in C3 Systems
[AD-A102371] N81-31426
A longitudinal study of computer voice recognition performance and vocabulary size
[AD-A102208] N81-31427
An introduction to a reliability shorthand
[AD-A102372] N81-31558
Development of a prototype North Pacific Ocean surface visibility climatology stratified by observations times
[AD-A102374] N81-31784
Application of satellite imagery to the assessment and exploitation of oceanic electromagnetic ducting
[AD-A102309] N81-31802

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Nonlinear equatorial spread F: The effect of neutral winds and background Pedersen conductivity
[AD-A102555] N81-31278
Measurements of the size distribution and solubility of Salty Dog pyrotechnic
[AD-A102547] N81-31388

NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.
Structural response methods and evaluation results for helicopter landing decks on 210- and 270-foot USCCG cutters
[AD-A102420] N81-31233
Stability characteristics of epoxy-impregnated superconducting magnets
[AD-A102419] N81-31953

NAVAL SURFACE WEAPONS CENTER, DAHLGREN, VA.
Pole position for 1980 based on Doppler observations of the GEOS-3 Satellite
[AD-A102548] N81-31727
Computation of the integral of the bivariate normal distribution over arbitrary polygons
[AD-A102466] N81-31928

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Space shuttle range safety command destruct system analysis and verification. Phase 2: Ordnance options for a space shuttle range safety command destruct system
[AD-A102320] N81-31268
Bandwidth and frequency enhancement of free electron laser in a mildly relativistic electron beam
[AD-A102164] N81-31538

NAVAL TRAINING EQUIPMENT CENTER, ORLANDO, FLA.
The effects of various fidelity factors on simulated helicopter hover
[AD-A102028] N81-31232

NEW ENGLAND COUNCIL OF WATER CENTER DIRECTORS, BOSTON, MASS.
Water, energy, and economic development towards an integrated regional policy analysis system: Selected background essays
[PB81-184129] N81-31674

NEW HAMPSHIRE UNIV., DURHAM.
Alternate fuels manufactured from high temperature solar thermal systems
[DOE/ET-21067/2] N81-31397

NEW JERSEY INST. OF TECH., NEWARK.
Dynamics of two-dimensional eye-head tracking
[AD-A102369] N81-31842

NEW YORK STATE DEPT. OF HEALTH, ALBANY.
Methane production rate studies and gas flow modeling for the Fresh Kills landfills
[PB81-196552] N81-31399

NEW YORK UNIV., N. Y.
Photoelectron emission spectroscopy of weak acids and bases and their ions in aqueous solution
[AD-A102427] N81-31285
Photoelectron emission spectroscopy of aqueous solutions
[AD-A102426] N81-31313
Circle graphs N81-31872
Transverse acoustic impedance of normal liquid He-3 N81-32060

NIELSEN ENGINEERING AND RESEARCH, INC., MOUNTAIN VIEW, CALIF.
Basic studies of body vortices at high angles of attack and supersonic speeds
[AD-A102241] N81-31154

NORTH CAROLINA UNIV. AT CHAPEL HILL.
Covariance operators and their applications in probability and information theory N81-31923

NORTH CAROLINA UNIV., CHAPEL HILL.
An asymptotic expansion of the distribution of the weighted-difference classification criterion for discrimination of two and three multivariate normal populations N81-31926

NORTHROP SERVICES, INC., RESEARCH TRIANGLE PARK, N. C.
Impact of gasohol on automobile evaporative and tailpipe emissions
[PB81-199952] N81-31400

NOVAR ELECTRONICS CORP., BARBERTON, OHIO.
Sonic simulation of the SPS power beam
[NASA-CR-161049] N81-31633

O

OAK RIDGE NATIONAL LAB., TENN.
Limits of studying high-spin states by discrete-line Gamma-ray spectroscopy
[CONF-8006160-1] N81-31321
Relative energy risk: Is solar energy riskier than nuclear
[CONF-810542-3] N81-31640
Net energy of seven small-scale hydroelectric power plants
[ORNL/TM-7694] N81-31649
Biological reduction of nitrate wastewater using fluidized-bed bioreactors
[CONF-810554-2] N81-31812
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
Doing a risk analysis
[CONF-810480-1] N81-31822
Health effects of low-level radiation
[CONF-810606-47] N81-31824
Status of the Tokamak program
[ORNL/TM-7778] N81-32039
Generalization of the Nernst-Einstein equation for self-diffusion in high-defect-concentration solids
[CONF-810566-1] N81-32066
Theoretical calculations of the electronic and vibrational structure of point defects in ionic crystals
[CONF-810573-1(DRAFT)] N81-32067
Proceedings of the Symposium: Perspectives on Scientific and Technical Information
[ORNL-5749] N81-32076

OBSERVATOIRE DE MEUDON (FRANCE).
Variable corpuscular and electromagnetic emissions from the Sun N81-31751
Solar cycle and solar terrestrial relationships N81-31752

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AERONAUTIQUES, PARIS (FRANCE).
The Cactus accelerometer N81-31177

OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, D. C.
Energy from open ocean kelp farms
[GPO-51-285] N81-31383

OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, WASHINGTON, D. C.
NTF and the Department of Defense N81-31133

OHIO STATE UNIV., COLUMBUS.
Corrosion and stress corrosion cracking of type 304 stainless steel and carbon steel in simulated boiling water reactor N81-31336
Moment method solutions for radiation and scattering from arbitrarily shaped surfaces N81-31416
A hybrid UTD-eigenfunction method for scattering by a vertex
[AD-A102137] N81-31429
The effect of a pulsed interference signal on an adaptive array
[AD-A102258] N81-31430
Thermal instability and convection in a horizontal layer of two immiscible fluids with internal energy generation N81-31501

A theoretical and experimental study of the static and dynamic behavior of vane-type pressure compensated hydraulic pumps with proportional-type regulator N81-31547

Analysis and design of continuously reinforced concrete pavements N81-31564

A spectrum of carbon dioxide from 800 to 5500 cm-1
[NASA-CR-164720] N81-31717

Communicating distributed processes: A programming language concept for distributed systems N81-31874

An approach to reliable integration testing
[AD-A102477] N81-31886

Hyperpions at the Z(0)
[DOE/ER-01545/306] N81-31968

Electron device contact studies
[AD-A102088] N81-32061

OHIO UNIV., ATHENS.

Modification of polystyrene with some naphthyridines to afford metal bonding sites N81-31359

Thermodynamic and magnetic properties of Hubbard lattices N81-32049

OKLAHOMA UNIV., NORMAN.

Applications of multiproperty analysis in the prediction of complex-system thermophysical behavior N81-31301

OLD DOMINION UNIV., NORFOLK, VA.

Exact finite elements for conduction and convection
[NASA-CR-164723] N81-31507

OREGON STATE UNIV., CORVALLIS.

Metabolism of hydrazine
[AD-A101849] N81-31818

Predicting unit variate values in a finite population N81-31925

P

PADUA UNIV. (ITALY).

Structure of H2-02 flames under pressure
[AD-A102108] N81-31312

PAN AMERICAN WORLD AIRWAYS, INC., JAMAICA, N. Y.

Performance deterioration: An airline perspective N81-31202

PEDCO-ENVIRONMENTAL, INC., ARLINGTON, TEX.

Evaluation of Texas Air Control Board management and operations systems requirements. Part 1: Identification of TACB, phase 1
[PB81-180945] N81-32078

Evaluation of Texas Air Control Board management and operations systems requirements. Part 2: Appendices to the part 1 report, phase 2
[PB81-180952] N81-32079

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.

Photochemistry and radiation chemistry of volatile silanes, germanes and phosphines
[DOE/ER-03416/21] N81-31325

Field tests of industrial stoker coal-fired boilers for emissions control and efficiency improvement, sites L1-L7
[PB81-196628] N81-31692

Membrane-membrane interactions in a lipid-containing bacteriophage system
[DOE/EV-03211/32] N81-31813

Acoustic radiation and diffraction from convex and concave domes
[AD-A102295] N81-31958

PLANNING RESEARCH CORP., WASHINGTON, D. C.

Lightning protection system for Space Shuttle
[NASA-CR-164742] N81-31277

POLYTECHNIC INST. OF NEW YORK, FARMINGDALE.

Change in reflectivity of metals under intense laser radiation, revision
[AD-A102005] N81-31342

Detection of moving targets by adaptive clutter suppression
[AD-A102273] N81-31428

Unstable resonators
[AD-A102071] N81-31540

PORTLAND CEMENT ASSOCIATION, SKOKIE, ILL.

Long-term creep of Hanford concrete at 250 deg F and 350 deg F
[RHO-C-50] N81-31405

PORTSMOUTH PUBLIC SCHOOLS, VA.

Solar heating and hot water system installed at James Hurst Elementary School, Portsmouth, Virginia
[NASA-CR-161830] N81-31625

PRATT AND WHITNEY AIRCRAFT GROUP, EAST HARTFORD, CONN.

JT9D jet engine diagnostics program N81-31199

JT8D engine performance retention N81-31200

Improving turbine engine compressor performance retention through airfoil coatings N81-31203

Advanced oxide dispersion strengthened sheet alloys for improved combustor durability N81-31204

Engine health monitoring systems: Tools for improved maintenance management in the 1980's N81-31214

PRATT AND WHITNEY AIRCRAFT GROUP, WEST PALM BEACH, FLA.

Mechanical properties of turbine blade alloys in hydrogen at elevated temperatures
[NASA-CR-161842] N81-31192

PRC SYSTEMS SCIENCES CO., HUNTSVILLE, ALA.

Electrochemical energy storage subsystems study, volume 1
[NASA-CR-165420-VOL-1] N81-31630

Electrochemical energy storage subsystems study, volume 2
[NASA-CR-165420-VOL-2] N81-31631

PRINCETON UNIV., N. J.

Transition and conversion trim-maps for the AV-8A VTOL aircraft
[AD-A102155] N81-31188

Pore-filling cements in turbidites; Southern California: Products of early diagenesis and dewatering of shale N81-31713

Banana drift transport in tokamaks with ripple
[PPPL-1784] N81-32032

Modular coils: A promising toroidal-reactor-coil system
[PPPL-1796] N81-32034

PROPELLANTS, EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT, WESTCOTT (ENGLAND).

On the calculation of thrust coefficient
[PERME-MEMO-150] N81-31284

PURDUE UNIV., LAFAYETTE, IND.

Spectral emissivity at high temperatures
[AD-A101949] N81-31311

The prediction of the freeze/thaw durability of coarse aggregate in concrete by mercury intrusion porosimetry
[PB81-200073] N81-31408

Problems in optimal filtering and stochastic control
[AD-A102478] N81-31929

Some sequential selection procedures for good regression models
[AD-A101921] N81-31930

Selection procedures for a problem in analysis of variance
[AD-A101922] N81-31931

Some locally optimal subset selection rules
[AD-A101923] N81-31932

On eliminating inferior regression models
[AD-A101924] N81-31933

Asymptotic (beta) subd joint normality of sample quantiles
[AD-A101991] N81-31934

Q

QEI, INC., BURLINGTON, MASS.

In support of the Joint Army/Navy Air Crew Impact Injury Prevention Program
[AD-A102505] N81-31819

QUEEN MARY COLL., LONDON (ENGLAND).

Long term variations of the solar constant N81-31767

The solar neutrino problem N81-31768

QUINBY (GILBERT F.), FORT WASHINGTON, PA.

Proceedings of the Public Workshop on Alternative Separation Concepts: Presentations, Discussions and Recommendations
[AD-A102519] N81-31183

R

R AND D ASSOCIATES, MARINA DEL REY, CALIF.

Casimir self-stress on a perfectly conducting cylindrical shell
[DOE/ER-01545-308] N81-31584

RADIAN CORP., AUSTIN, TEX.

Evaluation of maintenance for fugitive VOC emission control
[PB81-206005] N81-31702

RADIO TECHNICAL COMMISSION FOR AERONAUTICS, WASHINGTON, D. C.

Minimum operational performance standards for Microwave Landing System (MLS) airborne receiving equipment
[RTCA/DO-177] N81-31180

RAYTHEON CO., SUDBURY, MASS.

High resolution angular sensor
[NASA-CR-161843] N81-31528

RCA GOVERNMENT COMMUNICATIONS SYSTEMS, CAMDEN, N. J.

NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423

RCA LABS., PRINCETON, N. J.

Radiation-hardened N (+) gate CMOS/SOS
[AD-A102123] N81-32067

RENSSELAER POLYTECHNIC INST., TROY, N. Y.

Analytical models for simultaneous heat and moisture transport in soils
[RHO-LD-49] N81-31519

A dynamic model of the urban process
[PB81-196990] N81-31694

Advanced development of particle-beam-probe diagnostic systems
[DOE/ET-53004/20] N81-31981

REPUBLIC GEOTHERMAL, INC., SANTA FE SPRINGS, CALIF.

CO2 and carbonate chemistry applied to geothermal engineering. Guidance for interpreting and using chemical data about geothermal resources
[LBL-11509] N81-31645

RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).

The use of inductive position switches in personnel safety systems
[FOA-C-30166-E5] N81-31170

A study of the control principles of remotely controlled LV air defense missiles
[FOA-C-30180-E3] N81-31275

Investigation of the breakdown of carbon fiber electrical resistance of the resulting small particles
[FOA-C-20349-F9] N81-31291

RSV for aluminum
[FOA-C-20348-D4] N81-31341

Wind measurements by parachute
[FOA-C-20344-D2] N81-31748

Training for relaxation. An experiment at the military flight school
[FOA-C-59003-H9] N81-31841

Similarity of distorted pictures: On the interaction between edge blur and random noise
[FOA-C-53004-H9] N81-31845

Man and machine. An ergonometric perspective on various abilities, objectives and work patterns in the development of the system
[FOA-C-56020-H9] N81-31857

A small operating system for real-time runs on a Nord-10
[FOA-C-20336-E3] N81-31900

A regression analysis model with some transformations of the variables involved
[FOA-C-20332-D8] N81-31917

Display panel built using optical fibers and light emitting diodes
[FOA-C-30172-E1] N81-31992

The data processing system at FOA Institution 27 Software organization principles
[FOA-C-20361-D3] N81-32074

RICE UNIV., HOUSTON, TEX.

Certain physical properties of transition metal alloys N81-31333

Hydrogen in metals N81-31335

Conversion of methanol and light olefins to gasoline over a shape selective catalyst ZSM-5 N81-31379

Packet communication in delta and related networks N81-31417

Heat transfer in developing laminar pipe flow: With or without a phase change material around the pipe N81-31504

Electron beam pumped tunable excimer lasers N81-31533
Color center lasers for infrared spectroscopy N81-31536
Studies of dynamic and static response of cylindrical liquid-storage tanks N81-31565
Strain-hardening and rate effects in plasticity N81-31569
Interpreting electron temperature changes in the lower ionosphere N81-31705
Origin distribution and alteration of organic matter and generation and migration of hydrocarbons in Austin Chalk, Upper Cretaceous, Southeastern Texas N81-31711
A statistical investigation of the pulmonary effects of exposure of asbestos N81-31817
Critical dynamics of liquid crystal above the isotropic-nematic phase transition N81-32043
A spectrophotometric study of H 2 regions in chemically young galaxies N81-32093
Inert gases in fifteen iron meteorites N81-32103

ROCHESTER UNIV., N. Y.
Development of X-ray laser media: Measurement of gain and development of cavity resonators for wavelengths near 130 Angstroms
[AD-A102335] N81-31539
Computing with connections
[AD-A102221] N81-31885
Experience with generalized Hough Transform
[AD-A102222] N81-31913

ROCKWELL INTERNATIONAL CORP., LOS ANGELES, CALIF.
Aircraft design using the National Transonic Facility N81-31143
Proposed aeroelastic and flutter tests for the National Transonic Facility N81-31144

ROCKWELL INTERNATIONAL SCIENCE CENTER, THOUSAND OAKS, CALIF.
Superplastic forming and diffusion bonding of CORONA 5
[AD-A102206] N81-31344
High temperature mechanical properties of polyphase ceramics based on silicon nitride
[AD-A102121] N81-31372
Growth of HgCdTe by modified molecular beam epitaxy
[AD-A102272] N81-32064

ROLLS-ROYCE LTD., DERBY (ENGLAND).
Living with defects in powder metallurgy materials
[PNR-90065] N81-31352
A United Kingdom view on future fuels
[PNR-90068] N81-31398
Investigation of turbulence according to fluctuating radio reflections
[PNR-90063] N81-31793
Presentation to the European Union against Aircraft Nuisances
[PNR-90064] N81-31959

ROLLS-ROYCE LTD., LONDON (ENGLAND).
Performance retention of the RB211 powerplant in service N81-31201

ROSS (S.) AND CO., BOSTON, MASS.
NASA electronic message experiment and study: Detailed test plans
[NASA-CR-160007] N81-31423

ROYAL AIR FORCE HOSPITAL, HALTON (ENGLAND).
Cardiovascular problems during the pilots career N81-31837

ROYAL AIR FORCE INST. OF AVIATION MEDICINE, FARNBOROUGH (ENGLAND).
The speed of response to synthesized voice messages N81-31456
An automated multiple choice intelligibility testing system N81-31468
Lasers and protection of the eyes N81-31854

ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD (ENGLAND).
Wind-tunnel measurement of aerodynamic derivatives using flexible-sting rigs N81-31110

ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND).
Control derivatives N81-31119
Evaluation of 15th-order harmonics in the geopotential from analysis of resonant orbits
[RAE-TR-81006] N81-31267
The influence of abrasive fillers on the wear properties of polytetrafluoroethylene (PTFE)-based composites
[RAE-TR-75144] N81-31297
Flying helmet attenuation, and the measurement, with particular reference to the Mk 4 helmet N81-31473
Digital spectral analysis: A guide based on experience with aircraft vibration
[RAE-TR-81014] N81-31588
A technique for line extraction from LANDSAT multi-spectral scanner satellite data with some applications of the technique
[RAE-TR-81010] N81-31613

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
Double layers in the laboratory and above the aurora
[TRITA-EPP-80-12] N81-31735
Compact deferred correction formulas
[TRITA-NA-8007] N81-31918
Reports from the Departments of Electron and Plasma Physics: Index and Abstracts, 1980
[TRITA-EPP-80-13] N81-32042
The Voyager 1 Saturn encounter and the cosmogonic shadow effect
[TRITA-EPP-81-01] N81-32106

ROYAL MILITARY COLL. OF SCIENCE, SHRIVENHAM (ENGLAND).
Generalized dynamic stability for linearized yawing motion
[RMCS-80002] N81-31225

ROYAL NETHERLANDS AIR FORCE, SOESTERBERG.
Hearing standards for aircrew N81-31461

ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
Temperature variability and the 22 year solar cycle N81-31753
Linking ice sheet evolution to Milankovitch radiation variations: A model simulation of the global ice volume record N81-31775

ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
Report on the Military Microwaves' 1980 Conference
[RSRE-MEMO-3348] N81-31443
The collinear coaxial array antenna
[RSRE-MEMO-3350] N81-31444
PSEUDO: A macro based high level language for the PDP-11
[RSRE-MEMO-2875] N81-31904
The protection of front surfaced aluminum mirrors with diamond-like carbon coatings for use in the infrared
[RSRE-MEMO-3295] N81-32021

ROYAL SOCIETY, LONDON (ENGLAND).
A mode of dislocation-controlled rheology for the mantle
[ISSN-0080-4614] N81-31716

RUHR UNIV., BOCHUM (WEST GERMANY).
Kinetics of phase separation in fluid mixtures N81-31248

S

SAINT DAVID'S COLL., KENT (ENGLAND).
The 200, 22 and 11 year cycles and long series of climatic data, mainly since 200 AD N81-31757

SAINT LOUIS UNIV., MO.
A subsynoptic-scale kinetic energy study of the Red River Valley tornado outbreak (AVE-SESAME 1)
[NASA-CR-3456] N81-31745

SAINT PATRICK'S COLL., MAYNOOTH (IRELAND).
Chromospheric and photospheric evolution of an extremely active solar region in solar cycle 19
[NASA-CR-3377] N81-32108

SAN ANTONIO AIR LOGISTICS CENTER, KELLY AFB., TEX.
A-10/TF34 Turbine Engine Monitoring System (TEMS) N81-31211

SANDIA LABS., ALBUQUERQUE, N. MEX.
Effect of strain-rate and microstructure on the ductile brittle transition temperature in structural steels. Part 1: Literature assessment
[SAND-80-0732-PT-1] N81-31349
Aging characteristics of the SA1773 ceramic capacitor
[SAND-80-1132] N81-31374
Electromagnetic theta gun and tubular projectiles
[SAND-80-1988] N81-31490
Commercialization of a photovoltaic concentrator: Acurex report
[SAND-80-7082] N81-31665
Code translation program for Hewlett-Packard computers
[SAND-81-0627] N81-31897
Electron energy-distribution functions in gases
[CONF-810720-1] N81-31972
Temporal decay of the optically induced properties of a small-polaronic solid
[SAND-81-1268C] N81-32017
Particle beam fusion
[SAND-80-2500] N81-32038

SANDIA LABS., LIVERMORE, CALIF.
Dimensional instabilities in min-K 1400 above its expected service temperature
[SAND-81-8211] N81-31295
Selection and conceptual design of an advanced thermal-energy-storage subsystem for commercial-scale (100 MWe) solar central-receiver power plant
[SAND-80-8190] N81-31657
Solar power tower design guide: Solar thermal central receiver power systems. A source of electricity and/or process heat
[SAND-81-8005] N81-31670
Construction of integer-vector library routines for the CRAY computer
[SAND-81-8214] N81-32075

SANTA BARBARA RESEARCH CENTER, GOLETA, CALIF.
Advanced nSb monolithic Charge Coupled Infrared Imaging Devices (CCIRID)
[NASA-CR-165766] N81-31990

SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Treadmill testing for the detection of asymptomatic coronary disease in the healthy male N81-31833
Disposition of electrocardiographic abnormalities in aviation N81-31838

SCIENCE APPLICATIONS, INC., CANOGA PARK, CALIF.
Combustion in high speed air flows
[AD-A102336] N81-31320

SCIENCE APPLICATIONS, INC., LA JOLLA, CALIF.
Comparison of conventional and and solar-water-heating products and industries report
[DOE/CS-30217/T1] N81-31668
Satellite measurements of tropospheric aerosols
[NASA-CR-3459] N81-31680
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[AD-A102524] N81-32016
Simple fast routine for computation of energy transport by synchroton radiation in Tokamaks and similar geometries
[SAI-023-81-189-LJ] N81-32040
Profile effects of synchrotron radiation in deuterium-fueled Tokamaks
[SAI-023-81-215-LJ] N81-32041

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[AD-A102345] N81-31725

SCIENTIFIC SIMULATION CORP., ALBUQUERQUE, N. MEX.
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[SAND-80-7154/1-VOL-1] N81-31898
Programmers manual for IOSYM: An input-oriented simulation language for continuous systems. Volume 2: Subprogram description
[SAND-80-7154/2-VOL-2] N81-31899

SCIENTIFIC SYSTEMS, INC., CAMBRIDGE, MASS.
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[AD-A102145] N81-31909

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
ADS report number 4
[AD-A102111] N81-31592

SERVICE DE MEDECINE AERONAUTIQUE, VERSAILLES (FRANCE).
Echocardiography in aviation medicine N81-31831

SERVICE DE SANTE DES ARMEES, PARIS (FRANCE).
Conventional optical correction of ametropias in aeronautics N81-31850

SERVICE DE SANTE DES ARMEES, TOULON (FRANCE).
Continuous recording of the ECG according to the Holter method N81-31834
SERVICE DE SANTE POUR L'ARMEE DE L'AIR, PARIS (FRANCE).
The indications of the use of contact lenses in aeronautics N81-31851
Problems in aeronautics posed by visual deficiencies N81-31855
SHEAFFER AND ROLAND, INC., CHICAGO, ILL.
Barrier Island development near four National seashores
[PB81-196313] N81-31804
SHEFFIELD UNIV. (ENGLAND).
Three-dimensional model of spray combustion in gas-turbine combustors
[AD-A102506] N81-31221
Case studies in computer control
[RR-145] N81-31910
SIAM INST. FOR MATHEMATICS AND SOCIETY, PHILADELPHIA, PA.
Theory for coloring bivariate statistical maps
[DOE/EV-10428/9] N81-31610
SKF INDUSTRIES, INC., KING OF PRUSSIA, PA.
Development of small bore, high speed tapered roller bearing
[NASA-CR-165375] N81-31549
SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
Study of the dissociation of molecular hydrogen
[NASA-CR-161844] N81-31537
Satellite To Satellite Doppler Tracking (SSDT) for mapping of the Earth's gravity field
[NASA-CR-164722] N81-31601
Sounding-rocket experiment to study the diffuse soft X-ray background using a Si(Li) detector
[NASA-CR-164724] N81-31719
SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, LES MUREAUX (FRANCE).
SNIAS and the world market for application satellites
[SNIAS-802-422-106] N81-31270
Realization and performances of contoured polar three-dimensional carbon-carbon composites by a polar contoured weaving method
[SNIAS-802-422-104] N81-31296
SOUTH CAROLINA UNIV., COLUMBIA.
Nonparametric Bayes estimation of distribution functions and the study of probability density estimates
[AD-A102413] N81-31940
SOUTHAMPTON UNIV. (ENGLAND).
Assessing the effectiveness of auditory warnings N81-31457
An active noise reduction system for aircrew helmets N81-31470
SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Optimization of accelerated stability-test techniques for diesel fuels
[DOE/BC-10043/25] N81-31392
SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Atmospheric measurements of selected hazardous organic chemicals
[PB81-200628] N81-31328
Perception of spatial features with stereoscopic displays
[AD-A102156] N81-31436
Development of measurement methodology for, evaluating fugitive particulate emissions
[PB81-196594] N81-31690
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Observation of new resonance structure in the natural spin parity strange meson system
[SLAC-PUB-2729] N81-31967
High-current, short-pulse, RF-synchronized electron gun for the Stanford Linear Accelerator
[SLAC-PUB-2705] N81-31980
Status of the US heavy ion fusion program
[SLAC-PUB-2722] N81-32035
Long-range interactions in lattice field theory
[SLAC-240] N81-32069
STANFORD UNIV., CALIF.
A model-following technique for insensitive aircraft control systems N81-31223
Absorption spectroscopy of combustion gases using a tunable diode laser N81-31302
The separate roles of forest dislocations and subgrains in the isotropic hardening of type 304 stainless steel N81-31334
Plane-strain surface waves in a laminated composite
[AD-A102087] N81-31440
Statistics of noise in photodetection: Applications in magneto-optical recording N81-31477
Back stresses in monotonic and cyclic deformation: Transient and steady state behavior N81-31568
Nondestructive evaluation of path-independent integrals in fracture mechanics N81-31570
Acoustoelastic measurement of residual stresses N81-31571
Resonators with small apertures N81-31572
Experimental studies of the effects of ephemeral stream-flow depths on infiltration N81-31593
Atmospheric correction to LANDSAT data for limonite discrimination N81-31594
Characterization of material and electrical properties of polycrystalline silicon for photovoltiac applications N81-31624
Aeroelastic analysis of a troposkien-type wind turbine blade
[NASA-CR-165764] N81-31629
Solar space- and water-heating system at Stanford University. Central Food Services Building
[DOE/CS-31522/T2] N81-31655
Modeling and analysis of air-quality data
[DOE/EV-10428/8] N81-31686
Lithospheric structure of the eastern Snake River Plain, Idaho N81-31706
Kilauea volcano, Hawaii: Chronology and morphology of the surficial lava flows N81-31707
Possible influence of solar rotation on tropospheric circulation N81-31762
Integrating local information to understand dialog N81-31879
Long unimodal subsequences: A problem of F. R. K. Chung
[AD-A102168] N81-31914
Large deviation probabilities for certain dependent processes
[AD-A102166] N81-31942
Characterizations and goodness of fit tests
[AD-A102167] N81-31943
A parametric analysis of structured and unstructured Q-sort data
[AD-A102169] N81-31944
Tables of significance points for the variance weighted Kolmogorov-Smirnov statistics
[AD-A102052] N81-31945
The classification and mixture maximum likelihood approaches to cluster analysis
[AD-A102084] N81-31946
Large deviations for boundary crossing probabilities
[AD-A102142] N81-31947
Tests for standardized generalized variances of multivariate normal populations of possibly different dimensions
[AD-A102021] N81-31948
Remote atmospheric measurments with a tunable infrared laser source N81-31985
Measurement of infrared laser backscatter spectra from sulfuric acid and ammonium sulfate aerosols N81-31988
Layered superconducting composites N81-32044
STATE UNIV. OF NEW YORK, BROOKLYN.
Biological effects of ionizing radiation at the molecular, cellular, and organismal levels
[DOE/EV-10503/1] N81-31815
STATE UNIV. OF NEW YORK AT ALBANY.
A study of stratospheric discharges
[AD-A102284] N81-31726
STICHTING MATHEMATISCH CENTRUM, AMSTERDAM (NETHERLANDS).
Abstract storage structures
[MC-IW-158/81] N81-31901
Issues in the design of a beginners' programming language
[MC-IW-161/81] N81-31902
From Van Wijngaarden-grammar to ALEPH
[MC-IW-162/81] N81-31903
STOCKHOLM UNIV. (SWEDEN).
Estimated contributions of Swedish and outside sources to background aerosol concentrations in Sweden
[CM-50] N81-31688
Changing global biogeochemistry
[CM-52] N81-31689
STRATEGIC AIR COMMAND, OFFUTT AFB, NEBR.
Aircrew shielding to fast neutrons from nuclear detonations
[AD-A102239] N81-31820
STUTTGART UNIV. (WEST GERMANY).
Melting-pot free production of 3-5 semiconductor crystals in a mirror oven N81-31257
Joint European Torus (JET) design study 8.3: Quasi-continuous laser scattering. Part 2: Extension to spatial scan
[IPF-81-3-PT-2] N81-31544
SYRACUSE UNIV., N. Y.
Effect of oscillating flow on combustion rate of coal particles N81-31300
Time-domain in analysis of lumped/distributed networks for Electromagnetic Compatibility (EMC) applications
[AD-A102268] N81-31439
SYSTEMS CONTROL, INC., WEST PALM BEACH, FLA.
National icing facilities requirements investigation
[AD-A102520] N81-31238
SYSTEMS SCIENCE AND SOFTWARE, LA JOLLA, CALIF.
Baca geothermal demonstration project. Equation-of-state for water-carbon dioxide mixtures: Implications for Baca reservoir
[DOE/ET-27163/8] N81-31662

T

TAYLOR SYSTEMS ENGINEERING, INC., FAIR OAKS, CALIF.
Digitally-controlled adaptive welding system
[PB81-183907] N81-31556
TECHNISCHE UNIV., BERLIN (WEST GERMANY).
Performing experiments under space flight conditions in the domain of chemical engineering N81-31245
Development of a matter exchanger N81-31250
Interface convection under microgravity conditions N81-31999
TECHNISCHE UNIVERSITAET, CLAUSTHAL-ZELLERFELD (WEST GERMANY).
Reaction kinetics in molten glasses N81-31265
TECHNISCHE UNIVERSITAET, MUNICH (WEST GERMANY).
Bubble creation and heat transfer under one-gravity and micro-gravity conditions N81-31247
Concentration profiles in front of solidification fronts N81-31254
TELEDYNE BROWN ENGINEERING, HUNTSVILLE, ALA.
Advanced multiple processor configuration study
[AD-A101919] N81-31868
TELEDYNE GEOTECHNICAL, ALEXANDRIA, VA.
Seismic data analysis center
[AD-A102537] N81-31724
TEMPLE UNIV., PHILADELPHIA, PA.
The effects of altered sensory input on a skilled motor .ask N81-31840
TENNESSEE UNIV., KNOXVILLE.
Limits of studying high-spin states by discrete-line Gamma-ray spectroscopy
[CONF-8006160-1] N81-31321
Repair and cell cycle response in cells exposed to environmental biohazards
[DOE/EV-04568/T1] N81-31814
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Development and heat transfer analysis of direct coal fired MHD combustors
[DOE/ET-10815/T4] N81-31518
TEXAS A&M UNIV., COLLEGE STATION.
Contaminant transport in hydrogeologic systems
[PB81-202079] N81-31622
Survey and control of synthetic organics in Texas water supplies
[PB81-198384] N81-31698
An examination and comparison of two sampling procedures for estimating the reliability and amount of error in an information processing system N81-31924
TEXAS UNIV. AT ARLINGTON.
Summary and recommendations for the implementation of rigid pavement design, construction and rehabilitation techniques
[PB81-200578] N81-31409

Development of a ground signal processor for digital synthetic array radar data
[NASA-CR-161074] N81-31421

TEXTRON BELL HELICOPTER, FORT WORTH, TEX.
Helicopter propulsion system reliability and engine monitoring assessments N81-31213

An overview of SAE ARP 1587: Aircraft gas turbine engine monitoring system guide N81-31217

TORONTO UNIV., DOWNSVIEW (ONTARIO).
Orbital decay in a dynamic atmosphere
[UTIAS-244] N81-31266

Negative ion/molecule reactions in a negative corona discharge
[UTIAS-TN-230] N81-32027

TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS.
Fuel economy and exhaust emissions characteristics of diesel vehicles: Test results of a prototype Fiat 131 NA 2.4 liter automobile
[NASA-CR-165281] N81-32088

TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
JOVIAL (J73) computer validator
[AD-A102386] N81-31867

TRW, INC., CLEVELAND, OHIO.
Automated Plasma Spray (APS) process feasibility study
[NASA-CR-165418] N81-31193

TRW, INC., PHILADELPHIA, PA.
Optical fiber communications cable connector
[AD-A102508] N81-32015

TRW SEMICONDUCTORS, INC., LAWNDALE, CALIF.
Monolithic lumped element integrated circuit (M2LEIC) transistors
[AD-A102334] N81-31485

U

UELAND AND JUNKER, ARCHITECTS AND PLANNERS, PHILADELPHIA, PA.
Solar atrium: A hybrid solar heating and cooling system
[DOE/CS-34135/T4] N81-31659

UNION CARBIDE CORP., TARRYTOWN, N.Y.
COthane, methane from waste CO
[DOE/CS-40177/T2] N81-31396

UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
Study of the effects of gaseous environmental on the hot corrosion of superalloy materials
[NASA-CR-165464] N81-31339

Evolution of fuel nitrogen during the vacuum thermal devolatilization of coal
[DOE/ET-10744/T3] N81-31390

Simulation of D and E region high-power microwave heating with HF ionospheric modification experiments
[DOE/ER-10160/4] N81-31732

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, VILLA OBREGON.
Power spectra of the climatological variations in Mexico City N81-31755

UNIVERSITE CATHOLIQUE DE LOUVAIN (BELGIUM).
A critical review of modeling of the astronomical theory of paleoclimates and the future of our climate N81-31774

UNIVERSITY COLL., CARDIFF (WALES).
Quantum conformal fluctuations near the classical space-time singularity
[PREPRINT-64] N81-32071

UNIVERSITY OF SOUTH FLORIDA, TAMPA.
Time-domain in analysis of lumped/distributed networks for Electromagnetic Compatibility (EMC) applications
[AD-A102268] N81-31439

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Image understanding research
[AD-A102471] N81-31893

UNIVERSITY OF SOUTHERN CALIFORNIA, MARINA DEL REY.
Transformational implementation: An example
[AD-A101994] N81-31891

Design specification validation
[AD-A102361] N81-31892

UTAH STATE UNIV., LOGAN.
An investigation of a differential-integral method for calculating electromagnetic scattering by inhomogeneous objects N81-31412

V

VARTA BATTERIE A.G., HANOVER (WEST GERMANY).
Fabrication and testing of a prototype gas-recombination device for utility lead-acid cells
[ANL/OEPM-80-8] N81-31654

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
An algebraic approach to data-adaptive array processing
[AD-A101872] N81-31438

An adaptive ARMA spectral estimator, part 1
[AD-A101869] N81-31927

Computationally fast algorithms for ARMA spectral estimation
[AD-A102489] N81-31941

An adaptive ARMA spectral estimator, part 2
[AD-A101870] N81-31949

VIRGINIA UNIV., CHARLOTTESVILLE.
Minimum noise impact aircraft trajectories
[NASA-CR-164719] N81-31159

VOUGHT CORP., HAMPTON, VA.
Mail LOG: Program operating instructions
[NASA-CR-159065] N81-31881

W

WASHINGTON UNIV., SEATTLE.
Modeling and performance optimization of large-scale data-communication networks
[AD-A102341] N81-31437

Partially conserved axial-current noncanonicality and the Sigma commutator
[DOE/ER-05126/T2] N81-31487

WATER AND POWER RESOURCES SERVICE, DENVER, COLO.
Project skywater data inventory: SCPP season, Sierra Cooperative Pilot Project
[PB81-185803] N81-31794

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Essentials of ground-water hydrology pertinent to water-resources planning
[BULL-16-REV] N81-31606

WAYNE STATE UNIV., DETROIT, MICH.
Measurements of the CO laser characteristics by medium modulation N81-31534

Gallium-arsenide MIS and SIS solar cells utilizing tin-oxide N81-31623

WEAPONS SYSTEMS RESEARCH LAB., ADELAIDE (AUSTRALIA).
The equivalence of linearly constrained optimum array weight vectors under different optimization criteria
[AD-A102323] N81-31434

Optimum beamforming subject to multiple linear constraints
[AD-A102322] N81-31435

WEST VIRGINIA UNIV., MORGANTOWN.
Cross-strike structural discontinuties-tear faults and transfer zones in the central Appalachians of West Virginia N81-31712

WESTAT RESEARCH, INC., ROCKVILLE, MD.
Nonresidential building energy consumption survey
[DOE/EIA-0288] N81-31642

WESTINGHOUSE ELECTRIC CORP., CONCORDVILLE, PA.
Development and validation of reliability forecast techniques for selected thermomechanical components of gas-turbine combined-cycle plants: Guidelines for making reliability forecasts
[EPRI-AP-1848] N81-31664

WESTINGHOUSE HANFORD CO., RICHLAND, WASH.
Low-level-vibration effects on snubber life
[HEDL-SA-2231] N81-31585

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Silicone modified resins for graphite fiber laminates
[NASA-CR-165151] N81-31290

WILLIAMS RESEARCH CORP., WALLED LAKE, MICH.
Cruise missile engine program contract data requirements list sequence number 95. Qualification test report. Volume 39: Vibration and mission simulation testing on engine 828. XF-107-WR-400 cruise missile engine
[AD-A102257] N81-31220

WISCONSIN UNIV. - MADISON.
Dielectrophoresis N81-31304

Fluorescent probes in the solid state and their application to inorganic ion determinations N81-31305

Factors affecting graphite morphology, matrix structure and tensile properties of compacted graphite cast irons N81-31331

Reflection, transmission and radiation of an EM surface wave incident on a transition of surface reactance N81-31415

Normal mode global Rossby waves: Theory and observations N81-31704

A numerical model study of long-term planetary wave predictability N81-31710

WISCONSIN UNIV., MADISON.
Effect of production conditions on physical and mechanical properties of aluminum with low iron concentrates N81-31330

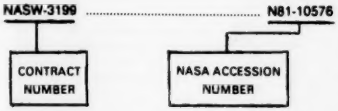
Thermal shocking an elastic half-space with a laser pulse N81-31562

Y

YOUNG (ARTHUR) AND CO., AUSTIN, TEX.
Evaluation of Texas Air Control Board management and operations systems requirements. Part 1: Identification of TACB, phase 1
[PB81-180945] N81-32078

Evaluation of Texas Air Control Board management and operations systems requirements. Part 2: Appendices to the part 1 report, phase 2
[PB81-180952] N81-32079

Typical Contract Number Index Listing



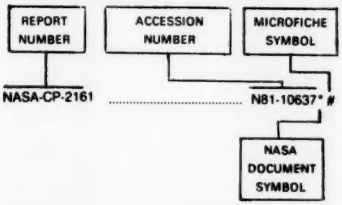
Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AF PROJ. 649L N81-31484
AF PROJ. 1710 ..... N81-31104
AF PROJ. 2301 ..... N81-31539
N81-31540
N81-31541
AF PROJ. 2304 ..... N81-31155
N81-31886
N81-31890
N81-31906
N81-31907
N81-31909
N81-31929
N81-31938
N81-31939
N81-31940
AF PROJ. 2305 ..... N81-31429
N81-31954
AF PROJ. 2306 ..... N81-31342
N81-31372
N81-32062
AF PROJ. 2307 ..... N81-31153
N81-31219
N81-31293
N81-31511
N81-31512
N81-31513
N81-31514
N81-31515
N81-31581
AF PROJ. 2308 ..... N81-31221
N81-31311
N81-31318
N81-31319
N81-31320
N81-31386
N81-31387
N81-31510
AF PROJ. 2310 ..... N81-31237
N81-31315
N81-31316
AF PROJ. 2311 ..... N81-31722
N81-32109
AF PROJ. 2312 ..... N81-31818
AF PROJ. 2313 ..... N81-31842
AF PROJ. 2338 ..... N81-31431
N81-31439
N81-31862
AF PROJ. 2532 ..... N81-31867
AF PROJ. 2698 ..... N81-32014
AF PROJ. 3221 ..... N81-32014
AF PROJ. 4305 ..... N81-31883
AF PROJ. 4519 ..... N81-31425
AF PROJ. 4643 ..... N81-31725
AF PROJ. 5581 ..... N81-31892
AF PROJ. 6114 ..... N81-31234
AF PROJ. 6302 ..... N81-31235
N81-31868
AF PROJ. 6687 ..... N81-31681
N81-31726
AF PROJ. 7140 ..... N81-31424
AF PROJ. 8920 ..... N81-31884
AF-AFOSR-0075-80 ..... N81-31273
AF-AFOSR-0093-79 ..... N81-31387
AF-AFOSR-0114-80 ..... N81-31842
AF-AFOSR-0118-80 ..... N81-31541
AF-AFOSR-0122-81 ..... N81-31906
AF-AFOSR-0174-80 ..... N81-31221
AF-AFOSR-2989-76 ..... N81-32062
AF-AFOSR-3063-76 ..... N81-31905
AF-AFOSR-3074-76 ..... N81-31843
AF-AFOSR-3189-77 ..... N81-31539
AF-AFOSR-3192-77 ..... N81-31540
AF-AFOSR-3271-77 ..... N81-31907
N81-31908
N81-31938
N81-31939
AF-AFOSR-3280-77 ..... N81-31311
AF-AFOSR-3286-77 ..... N81-31929
AF-AFOSR-3305-77 ..... N81-31514
AF-AFOSR-3336-77 ..... N81-31386
AF-AFOSR-3542-78 ..... N81-31155
AF-AFOSR-3546-78 ..... N81-31437
AF-AFOSR-3557-78 ..... N81-31342
AF-AFOSR-3562-78 ..... N81-31513
AF-AFOSR-05558-81 ..... N81-31864
ARPA ORDER 2307 ..... N81-31274
ARPA ORDER 2684 ..... N81-31428
ARPA ORDER 3291 ..... N81-31723
DA PROJ. 1L1-62701-AH-92 ..... N81-32015
DA PROJ. 1L2-63702-DG-10 ..... N81-31639
DA PROJ. 1T1-61102-BH-57 ..... N81-31312
N81-31314
DA PROJ. 2Q1-6374-A-774 ..... N81-31856
DA-ERO-75-G-0152 ..... N81-31312
DA-ERO-77-G-015 ..... N81-31314
DAAK10-77-C-0134 ..... N81-31343
DAAK20-80-C-0314 ..... N81-31639
DAAK80-79-C-0772 ..... N81-32015
DAHC19-77-C-0054 ..... N81-31856
DARPA ORDER 2551 ..... N81-31724
DARPA ORDER 3119 ..... N81-31893
DARPA ORDER 3704 ..... N81-32064
DE-AB01-76OS-31020 ..... N81-31666
DE-AB01-77ET-10069 ..... N81-31389
DE-AB03-77CS-31522 ..... N81-31655
DE-AC01-76ET-10348 ..... N81-31554
DE-AC01-77ET-10245 ..... N81-31350
N81-31351
DE-AC01-78CS-20098 ..... N81-31394
DE-AC01-78EI-06389 ..... N81-31642
DE-AC01-78ET-10029 ..... N81-31731
DE-AC01-78RA-03395 ..... N81-31952
DE-AC01-79CS-20237 ..... N81-31667
DE-AC01-79ET-14809 ..... N81-31322
DE-AC02-76CH-00016 ..... N81-31658
N81-31683
N81-31729
DE-AC02-76CH-03000 ..... N81-31962
N81-31969
DE-AC02-76ER-01198 ..... N81-31488
DE-AC02-76ER-01545 ..... N81-31584
N81-31968
DE-AC02-76ET-20279 ..... N81-31491
DE-AC02-76EV-01332 ..... N81-31684
DE-AC02-77CH-0017 ..... N81-31404
DE-AC02-77CH-00178 ..... N81-31347
N81-31650
N81-32077
DE-AC02-78CS-34698 ..... N81-31669
DE-AC02-78ET-21056 ..... N81-31651
DE-AC02-79CS-10046 ..... N81-31660
DE-AC02-79ET-10815 ..... N81-31518
DE-AC02-79ET-21067 ..... N81-31397
DE-AC02-80ER-10556 ..... N81-31346
DE-AC02-80EV-10428 ..... N81-31610
N81-31686
DE-AC02-80EV-10503 ..... N81-31815
DE-AC03-76SF-00515 ..... N81-31967
N81-31980
N81-32035
N81-32069
DE-AC03-78CS-20030 ..... N81-31643
DE-AC03-78CS-40177 ..... N81-31396
DE-AC03-80CS-30217 ..... N81-31668
DE-AC03-81ER-53113 ..... N81-32040
N81-32041
DE-AC04-76DP-00487 ..... N81-31395
DE-AC04-76DP-00613 ..... N81-31348
N81-31531
N81-31552
N81-31553
N81-31586
DE-AC04-76DP-00656 ..... N81-31375
DE-AC04-76DP-00789 ..... N81-31295
N81-31349
N81-31374
N81-31490
N81-31641
N81-31656
N81-31657
N81-31663
N81-31665
N81-31670
N81-31897
N81-31898
N81-31899
N81-31972
N81-32017
N81-32038
N81-32075
DE-AC06-76ER-01388 ..... N81-31487
DE-AC06-76RL-01830 ..... N81-31791
N81-31792
DE-AC06-77RL-01030 ..... N81-31405
N81-31519
DE-AC07-76ID-01570 ..... N81-31652
DE-AC08-76NV-01183 ..... N81-31532
DE-AC09-76SR-00001 ..... N81-31687
N81-31982
DE-AC14-76FF-02170 ..... N81-31585
DE-AC18-78FC-0203 ..... N81 31323
DE-AC19-79BC-10043 ..... N81-31392
DE-AC21-78ET-10744 ..... N81-31390
DE-AC22-79ET-14806 ..... N81-31391
DE-AI01-76ET-20320 ..... N81-31628
DE-AI01-77CS-51040 ..... N81-32087
DE-AI01-77ET-10769 ..... N81-31632
N81-32026
DE-AI01-80CS-50194 ..... N81-32088
DE-AI01-80ER-10160 ..... N81-31732
DE-AI02-79CH-10003 ..... N81-31678
DE-AI04-80AL-12726 ..... N81-31308
DE-AI05-80OR-20679 ..... N81-31591
DE-AI06-79RL-10077 ..... N81-31677
DE-AM02-76CH-03073 ..... N81-32032
N81-32034
DE-AS02-76ER-03416 ..... N81-31325
DE-AS02-76ET-52040 ..... N81-31977
N81-32030
N81-32031
DE-AS02-76ET-53004 ..... N81-31981
DE-AS02-76EV-02311 ..... N81-31813
DE-AS05-76ER-04936 ..... N81-31321
DE-AS05-76ER-05126 ..... N81-31487
DE-AS05-76EV-04568 ..... N81-31814
DE-AS05-79ER-10424 ..... N81-31975
DE-AS07-79ID-12051 ..... N81-31393
DE-AT03-76ET-51011 ..... N81-31896
N81-31973

DE-AT03-76EV-74010 ..... N81-31685
DE-A101-77CS-51044 ..... N81-31627
DE-A101-80ER-10160 ..... N81-31676
DE-FC03-78ET-27163 ..... N81-31662
DE-FG01-80RA-50366 ..... N81-32089
DE-FG02-77CS-34135 ..... N81-31659
DE-FG03-79ET-27035 ..... N81-31609
DEN3-51 ..... N81-31632
DI-BM-J0-188056 ..... N81-31355
DI-BM-J0-188081 ..... N81-31496
DI-14-34-0001-0127 ..... N81-31697
DI-14-34-0001-0146 ..... N81-31622
N81-31698
DI-14-34-0001-1146 ..... N81-31622
DI-14-34-0001-7162 ..... N81-31701
DI-14-34-0001-9028 ..... N81-31619
DI-14-34-0001-9046 ..... N81-31622
N81-31698
DI-14-34-0001-9412 ..... N81-31674
DLA900-78-C-1715 ..... N81-31371
DNA PROJ. S99-QAXH1004-30 ..... N81-32013
DNA001-76-C-0194 ..... N81-32016
DNA001-79-C-0116 ..... N81-32013
DOE-EF-77-C-01-2609 ..... N81-31692
DOT-FA79NA-6010 ..... N81-31218
DOT-HS-7-01789 ..... N81-31555
DOT-HS-9-02110 ..... N81-31298
N81-31299
DOT-RC-82009 ..... N81-31703
DOT-RC-82016 ..... N81-31694
DOT-RC-92014 ..... N81-31560
DTFA01-80-C-10080 ..... N81-31238
DTFA03-80-C-00082 ..... N81-31183
EF-77-C-01-2591 ..... N81-31350
EF-77-C-01-2592 ..... N81-31351
EG-77-C-01-4042 ..... N81-31404
N81-32077
EG-77-G-04-4135 ..... N81-31659
EI-78-C-016389 ..... N81-31642
EM-78-C-02-4698 ..... N81-31669
EM-78-F01-5205 ..... N81-31625
EPA-CA-805990 ..... N81-31328
EPA-IAG-D7-E681FZ N81-31692
EPA-R-804433 ..... N81-31693
EPA-68-02-2535 ..... N81-32078
N81-32079
EPA-68-02-2566 ..... N81-31400
EPA-68-02-2627 ..... N81-31696
EPA-68-02-2702 ..... N81-31738
EPA-68-02-2752 ..... N81-31690
EPA-68-03-2569 ..... N81-31691
EPA-68-03-2776 ..... N81-31702
EPA-68-03-2835 ..... N81-32092
EPRI PROJ. 1188 ..... N81-31664
EQ10AC25 ..... N81-32080
EQ10AC021 ..... N81-31804
ESTEC-3625/78/NL-AK(SC) N81-31279
N81-31280
ET-78-C-01-3407 ..... N81-31651
EW-78-C-03-2030 ..... N81-31323
FAA PROJ. 052-241-320 ..... N81-31181
FAA PROJ. 151-413-420 ..... N81-31787
FEA-CO-04-60588-00 ..... N81-31646
FEA-C0-04-60588-00 ..... N81-31647
N81-31648
FWS-14-16-009-78-969 ..... N81-31682
F08606-79-C-0006 ..... N81-31724
F19628-77-C-02262 ..... N81-31316
F19628-78-C-0007 ..... N81-31726
F19628-78-C-0073 ..... N81-31725
F19628-78-C-0198 ..... N81-31429
F19628-79-C-0022 ..... N81-31722
F19628-79-C-0062 ..... N81-31315
F19628-80-C-0001 ..... N81-31424
F19628-80-C-0002 ..... N81-31433
N81-31484
N81-32014
F19628-80-C-0029 ..... N81-31954
F19628-81-C-0001 ..... N81-31425
N81-31884
F30602-78-C-0120 ..... N81-31431
F30602-78-C-0221 ..... N81-31862
F30602-79-C-0011 ..... N81-31439
F30602-79-C-0015 ..... N81-31883
F30602-79-C-0042 ..... N81-31892
F30602-79-C-0221 ..... N81-31867
F33615-77-C-0080 ..... N81-31234
F33615-77-C-1002 ..... N81-32061
F33615-79-C-631 ..... N81-31909
F33615-79-C-0003 ..... N81-31868
F33615-79-C-0013 ..... N81-31235
F33615-79-C-0517 ..... N81-31818
F33615-79-C-2092 ..... N81-31216
F33615-80-C-0512 ..... N81-31681
F33615-80-C-1080 ..... N81-31893
F44620-76-C-0048 ..... N81-31515
F44620-76-C-0096 ..... N81-31153
F49520-79-C-0152 ..... N81-31886
F49620-77-C-0029 ..... N81-31319
F49620-77-C-0033 ..... N81-31318
F49620-77-C-0051 ..... N81-31581
F49620-77-C-0072 ..... N81-31372
F49620-78-C-0071 ..... N81-31511
F49620-79-C-0033 ..... N81-31512
F49620-79-C-0140 ..... N81-31940
F49620-79-C-0173 ..... N81-31864
F49620-79-C-0178 ..... N81-31410
F49620-80-C-0001 ..... N81-31890
F49620-80-C-0010 ..... N81-31293
F49620-80-C-0018 ..... N81-31723
F49620-80-C-0065 ..... N81-31510
F49620-80-C-0082 ..... N81-31320
F49620-80-C-0090 ..... N81-31237
MDA903-79-C-0188 ..... N81-32064
MIPR-FY-7121-81-10000 ..... N81-32109
MIPR-Z-70099-6-65439 ..... N81-31233
NAG3-56 ..... N81-31125
NAG5-36 ..... N81-31601
NASA ORDER C-32817-D N81-32088
NASA ORDER H-12261B N81-32108
NASW-3113 ..... N81-32086
NAS1-10843 ..... N81-31579
NAS1-13500 ..... N81-31881
NAS1-14887 ..... N81-31576
NAS1-15116 ..... N81-31224
NAS1-15268 ..... N81-31160
NAS1-15347 ..... N81-31271
NAS1-15551 ..... N81-31990
NAS1-15792 ..... N81-31127
NAS1-15840 ..... N81-31580
NAS1-16000 ..... N81-31184
NAS1-16037 ..... N81-31171
NAS2-10722 ..... N81-31213
NAS3-20072 ..... N81-31204
NAS3-20112 ..... N81-31193
NAS3-20632 ..... N81-31199
NAS3-20839 ..... N81-31549
NAS3-21382 ..... N81-31361
NAS3-21962 ..... N81-31630
N81-31631
NAS3-22048 ..... N81-31290
NAS3-22049 ..... N81-31194
NAS3-22175 ..... N81-31288
NAS3-22488 ..... N81-31339
NAS3-22500 ..... N81-31419
NAS5-20591 ..... N81-31476
NAS5-23844 ..... N81-31626
NAS5-24420 ..... N81-31762
NAS5-25054 ..... N81-32096
NAS5-25356 ..... N81-31861
NAS5-25648 ..... N81-31423
NAS5-26239 ..... N81-32073
NAS5-26336 ..... N81-31991
NAS6-3117 ..... N81-31605
NAS8-31840 ..... N81-31528
NAS8-33064 ..... N81-31602
NAS8-33370 ..... N81-31745
NAS8-33521 ..... N81-31537
NAS8-33561 ..... N81-31192
NAS8-34185 ..... N81-31603
N81-31607
NAS9-15800 ..... N81-31596
N81-31597
N81-31598
N81-31599
N81-31882
NAS9-15981 ..... N81-31600
NAS9-16055 ..... N81-31633
NAS9-16104 ..... N81-31421
NGL-05-020-243 ..... N81-31629
NGL-22-009-124 ..... N81-31559
N81-31952
NGR-05-020-559 ..... N81-31762
NIVR-1738 ..... N81-31523
N81-31526
NIVR-1768 ..... N81-31157
NIVR-1865 ..... N81-31525
NR PROJ. 039-202 ..... N81-31370
NR PROJ. 041-516 ..... N81-31559
NR PROJ. 042-034 ..... N81-31948
NR PROJ. 042-267 ..... N81-31914
N81-31942
N81-31943
N81-31946
NR PROJ. 051-258 ..... N81-31285
N81-31313
NR PROJ. 051-579 ..... N81-31286
N81-31317
NR PROJ. 064-640 ..... N81-31866
NR PROJ. 064-651 ..... N81-31582
N81-31583
NR PROJ. 150-395 ..... N81-31937
NR PROJ. 207-114 ..... N81-31819
NR PROJ. 215-262 ..... N81-31188
NSF ATM-77-20580 ..... N81-31762
NSF ATM-77-26521 ..... N81-31769
NSF ATM-79-13251 ..... N81-31776
NSF ATM-79-19866 ..... N81-31771
NSF DAR-79-17713 ..... N81-31406
NSF DAR-80-09700 ..... N81-31556
NSF ECS-79-13148 ..... N81-31410
NSF ECS-80-11262 ..... N81-31437
NSF ENG-77-12946 ..... N81-31905
NSF ENG-78-10442 ..... N81-31410
NSF ENV 76-04264 ..... N81-31410
NSF MCF-79-12179 ..... N81-31888
NSF MCS-76-8390 ..... N81-31891
NSF MCS-79-12179 ..... N81-31889
NSF MCS-80-18769 ..... N81-31886
NSF MCS-80-24649 ..... N81-31947
NSF OCE-16827 ..... N81-31807
NSF PFR-79-08261 ..... N81-31410
NSF SES-79-13976 ..... N81-31948
NSG-1321 ..... N81-31507
NSG-1509 ..... N81-31159
NSG-1603 ..... N81-31911
NSG-2119 ..... N81-31847
NSG-3252 ..... N81-31340
NSG-3303 ..... N81-31628
NSG-5009 ..... N81-31362
NSG-5281 ..... N81-31718
NSG-5304 ..... N81-31719
NSG-7336 ..... N81-31810
NSG-7479 ..... N81-31717
NSG-7559 ..... N81-32107
NSG-8041 ..... N81-31634
N00014-17-C-0306 ..... N81-31947
N00014-69-A-0200 ..... N81-31762
N00014-75-C-0397 ..... N81-31285
N81-31313
N00014-75-C-0442 ..... N81-31948
N00014-75-C-0455 ..... N81-31930
N81-31931
N81-31932
N81-31933
N81-31934
N00014-75-C-0642 ..... N81-31889
N00014-75-C-0880 ..... N81-31286
N81-31317
N00014-76-C-0054 ..... N81-31440
N00014-76-C-0144 ..... N81-31428
N00014-76-C-0475 ..... N81-31914
N81-31942
N81-31943
N81-31944
N81-31945
N81-31946
N00014-77-C-0097 ..... N81-31937
N00014-77-C-0224 ..... N81-31559
N00014-78-C-0121 ..... N81-31819
N00014-78-C-0164 ..... N81-31885
N81-31913
N00014-78-C-0381 ..... N81-31188
N00014-78-C-0490 ..... N81-31154
N00014-78-C-0572 ..... N81-31912
N00014-78-C-0655 ..... N81-31935
N81-31936
N00014-78-C-0891 ..... N81-32065
N00014-79-C-0742 ..... N81-31436
N00014-80-C-0150 ..... N81-31844
N00014-80-C-0197 ..... N81-31885
N00014-80-C-0303 ..... N81-31438
N81-31941
N81-31949
N00014-80-C-0321 ..... N81-31935
N81-31936
N00014-80-C-0364 ..... N81-31865
N81-31866
N00014-80-C-0440 ..... N81-31592
N00014-80-C-0505 ..... N81-31888

N81-31889
N00014-80-C-0616 ..... N81-31582
N81-31583
N00014-80-C-0733 ..... N81-31370
N00014-80-C-0779 ..... N81-31310
N81-31367
N81-31368
N81-31369
N00014-80-C-0796 ..... N81-32101
N00017-72-C-4401 ..... N81-31274
N00019-78-C-0206 ..... N81-31220
N00019-79-C-0203 ..... N81-31292
N00019-79-C-0465 ..... N81-31344
N00019-80-C-0284 ..... N81-31432
N00024-78-C-5384 ..... N81-32109
N00024-79-C-6043 ..... N81-31958
N00024-81-C-5301 ..... N81-31274
N00173-77-C-0340 ..... N81-31485
N00173-79-C-0191 ..... N81-31863
N00173-80-C-0099 ..... N81-31976
N00228-76-C-2129 ..... N81-31785
PROJ. AGRISTARS N81-31596
N81-31597
N81-31598
N81-31599
N81-31600
RR0141104 ..... N81-31154
RR0330244 ..... N81-31278
SO380SL001 ..... N81-31953
SRI PROJ. 8899 ..... N81-31436
W-31-109-ENG-38 ..... N81-31345
N81-31644
N81-31653
N81-31654
N81-31790
N81-31821
N81-31823
N81-31964
N81-31965
N81-31970
W-7405-ENG-26 ..... N81-31640
N81-31649
N81-31812
N81-31822
N81-31824
N81-32039
N81-32066
N81-32067
N81-32076
W-7405-ENG-36 ..... N81-31611
N81-31728
N81-31869
N81-31894
N81-31915
N81-31916
N81-31963
N81-32018
N81-32029
N81-32033
N81-32037
N81-32110
W-7405-ENG-48 ..... N81-31294
N81-31486
N81-31489
N81-31517
N81-31542
N81-31645
N81-31682
N81-31730
N81-31811
N81-31895
N81-31966
N81-31978
N81-31979
N81-32036
N81-32068
W-7405-ENG-48 OI MF N81-31324
W-7405-ENG-82 ..... N81-31971
WF21200000 ..... N81-31191
WF212421091 ..... N81-31191
WR02402001 ..... N81-31388
63-2455-2309 ..... N81-31882
146-40-01-02 ..... N81-31801
201-521-160 ..... N81-31218
304-91-27 ..... N81-31365
505-31-63-01 ..... N81-31130
505-31-63-06 ..... N81-31227
505-32-02 ..... N81-31956
N81-31957
505-32-42 ..... N81-31550
505-32-52 ..... N81-31129
505-32-62 ..... N81-31190
505-33-12 ..... N81-31340
505-33-21 ..... N81-31289
505-33-23-02 ..... N81-31578
505-33-33-02 ..... N81-31360
505-34-13-02 ..... N81-31418
505-35-31 ..... N81-31228
505-35-41 ..... N81-31162
505-51-11 ..... N81-31508
505-55 ..... N81-31282
506-55-072 ..... N81-31630
N81-31631
506-009-01-01 ..... N81-31577
510-55-12 ..... N81-31126
530-01-13-02 ..... N81-31184
530-04-13 ..... N81-31160
535-01-12 ..... N81-31195
776-72-41 ..... N81-31308
778-11-05 ..... N81-32026
778-35-03 ..... N81-32087
778-36-06 ..... N81-31627

Typical Report/Accession Number Index Listing



Listings in this index are arranged alpha-numerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-8022 ..... N81-31185* #
A-8567 ..... N81-31162* #
A-8654 ..... N81-31228* #
A-8684 ..... N81-31289* #

AAE-81-1 ..... N81-31386 #

AD-A101836 ..... N81-31237 #
AD-A101849 ..... N81-31818 #
AD-A101851 ..... N81-31906 #
AD-A101869 ..... N81-31927 #
AD-A101870 ..... N81-31949 #
AD-A101872 ..... N81-31438 #
AD-A101908 ..... N81-31843 #
AD-A101913 ..... N81-31976 #
AD-A101915 ..... N81-31343 #
AD-A101919 ..... N81-31868 #
AD-A101920 ..... N81-31890 #
AD-A101921 ..... N81-31930 #
AD-A101922 ..... N81-31931 #
AD-A101923 ..... N81-31932 #
AD-A101924 ..... N81-31933 #
AD-A101944 ..... N81-31153 #
AD-A101945 ..... N81-32062 #
AD-A101949 ..... N81-31311 #
AD-A101950 ..... N81-31856 #
AD-A101951 ..... N81-31235 #
AD-A101991 ..... N81-31934 #
AD-A101994 ..... N81-31891 #
AD-A101999 ..... N81-31582 #
AD-A102005 ..... N81-31342 #
AD-A102021 ..... N81-31948 #
AD-A102023 ..... N81-31182 #
AD-A102024 ..... N81-31583 #
AD-A102025 ..... N81-31559* #
AD-A102027 ..... N81-31787 #
AD-A102028 ..... N81-31232 #
AD-A102030 ..... N81-31386 #
AD-A102041 ..... N81-31905 #
AD-A102042 ..... N81-31512 #
AD-A102052 ..... N81-31945 #
AD-A102053 ..... N81-31785 #
AD-A102057 ..... N81-31938 #
AD-A102058 ..... N81-31939 #
AD-A102059 ..... N81-31907 #
AD-A102060 ..... N81-31908 #
AD-A102065 ..... N81-31864 #
AD-A102069 ..... N81-31286 #
AD-A102071 ..... N81-31540 #
AD-A102072 ..... N81-31513 #
AD-A102083 ..... N81-31639 #
AD-A102084 ..... N81-31946 #
AD-A102087 ..... N81-31440 #
AD-A102088 ..... N81-32061 #
AD-A102091 ..... N81-31273 #
AD-A102108 ..... N81-31312 #
AD-A102111 ..... N81-31592 #
AD-A102112 ..... N81-31317 #
AD-A102113 ..... N81-31191 #
AD-A102121 ..... N81-31372 #
AD-A102123 ..... N81-32065 #
AD-A102137 ..... N81-31429 #
AD-A102142 ..... N81-31947 #
AD-A102143 ..... N81-31433 #
AD-A102144 ..... N81-31484 #
AD-A102145 ..... N81-31909 #
AD-A102155 ..... N81-31188 #
AD-A102156 ..... N81-31436 #
AD-A102157 ..... N81-31888 #
AD-A102158 ..... N81-31889 #
AD-A102159 ..... N81-31218 #
AD-A102163 ..... N81-31181 #
AD-A102164 ..... N81-31538 #
AD-A102166 ..... N81-31942 #
AD-A102167 ..... N81-31943 #
AD-A102168 ..... N81-31914 #
AD-A102169 ..... N81-31944 #
AD-A102170 ..... N81-31219 #
AD-A102174 ..... N81-31155 #
AD-A102176 ..... N81-31510 #
AD-A102180 ..... N81-31884 #
AD-A102205 ..... N81-31432 #
AD-A102206 ..... N81-31344 #
AD-A102207 ..... N81-31954 #
AD-A102208 ..... N81-31427 #
AD-A102209 ..... N81-31786 #
AD-A102212 ..... N81-31371 #
AD-A102216 ..... N81-31937 #
AD-A102217 ..... N81-31292 #
AD-A102218 ..... N81-31883 #
AD-A102221 ..... N81-31885 #
AD-A102222 ..... N81-31913 #
AD-A102239 ..... N81-31820 #
AD-A102241 ..... N81-31154 #
AD-A102252 ..... N81-31863 #
AD-A102255 ..... N81-31844 #
AD-A102257 ..... N81-31220 #
AD-A102258 ..... N81-31430 #
AD-A102259 ..... N81-31681 #
AD-A102261 ..... N81-31424 #
AD-A102262 ..... N81-31315 #
AD-A102265 ..... N81-31865 #
AD-A102266 ..... N81-31866 #
AD-A102268 ..... N81-31439 #
AD-A102271 ..... N81-31431 #
AD-A102272 ..... N81-32064 #
AD-A102273 ..... N81-31428 #
AD-A102284 ..... N81-31726 #
AD-A102286 ..... N81-31314 #
AD-A102290 ..... N81-31367 #
AD-A102291 ..... N81-31369 #
AD-A102292 ..... N81-31368 #
AD-A102293 ..... N81-31310 #
AD-A102295 ..... N81-31958 #
AD-A102300 ..... N81-31316 #
AD-A102301 ..... N81-32109 #
AD-A102302 ..... N81-31722 #
AD-A102305 ..... N81-31862 #
AD-A102309 ..... N81-31802 #
AD-A102320 ..... N81-31268 #
AD-A102321 ..... N81-32063 #
AD-A102322 ..... N81-31435 #
AD-A102323 ..... N81-31434 #
AD-A102324 ..... N81-31516 #
AD-A102330 ..... N81-31514 #
AD-A102333 ..... N81-31723 #
AD-A102334 ..... N81-31485 #
AD-A102335 ..... N81-31539 #
AD-A102336 ..... N81-31320 #
AD-A102341 ..... N81-31437 #
AD-A102342 ..... N81-31515 #
AD-A102343 ..... N81-31803 #
AD-A102344 ..... N81-31293 #
AD-A102345 ..... N81-31725 #
AD-A102355 ..... N81-31236 #
AD-A102361 ..... N81-31892 #
AD-A102362 ..... N81-31425 #
AD-A102365 ..... N81-31370 #
AD-A102367 ..... N81-31581 #
AD-A102368 ..... N81-31511 #
AD-A102369 ..... N81-31842 #
AD-A102371 ..... N81-31426 #
AD-A102372 ..... N81-31558 #
AD-A102374 ..... N81-31784 #
AD-A102377 ..... N81-31274 #
AD-A102386 ..... N81-31867 #
AD-A102388 ..... N81-31104 #
AD-A102392 ..... N81-31887 #
AD-A102394 ..... N81-31788 #
AD-A102396 ..... N81-31789 #
AD-A102411 ..... N81-31319 #
AD-A102413 ..... N81-31940 #
AD-A102415 ..... N81-31318 #
AD-A102419 ..... N81-31953 #
AD-A102420 ..... N81-31233 #
AD-A102426 ..... N81-31313 #
AD-A102427 ..... N81-31285 #
AD-A102444 ..... N81-31912 #
AD-A102466 ..... N81-31928 #
AD-A102471 ..... N81-31893 #
AD-A102477 ..... N81-31886 #
AD-A102478 ..... N81-31929 #
AD-A102487 ..... N81-31541 #
AD-A102489 ..... N81-31941 #
AD-A102495 ..... N81-31187 #
AD-A102505 ..... N81-31819 #
AD-A102506 ..... N81-31221 #
AD-A102507 ..... N81-31387 #
AD-A102508 ..... N81-32015 #
AD-A102510 ..... N81-31234 #
AD-A102514 ..... N81-32014 #
AD-A102519 ..... N81-31183 #
AD-A102520 ..... N81-31238 #
AD-A102523 ..... N81-32013 #
AD-A102524 ..... N81-32016 #
AD-A102537 ..... N81-31724 #
AD-A102547 ..... N81-31388 #
AD-A102548 ..... N81-31727 #
AD-A102550 ..... N81-32101 #
AD-A102555 ..... N81-31278 #
AD-A102559 ..... N81-31935 #
AD-A102562 ..... N81-31936 #

AD-E400610 ..... N81-31343 #
AD-E850083 ..... N81-31789 #
AD-E850087 ..... N81-31788 #

AEROCHEM-TP-411 ..... N81-31318 #
AEROCHEM-TP-413 ..... N81-31319 #

AERONOMICA-ACTA-A-228-1981 ..... N81-31269

AFAMRL-TR-80-125 ..... N81-31681 #
AFAMRL-TR-81-26 ..... N81-31818 #

AFGL-TR-81-0003 ..... N81-31316 #
AFGL-TR-81-0024 ..... N81-32109 #
AFGL-TR-81-0042 ..... N81-31725 #
AFGL-TR-81-0119 ..... N81-31722 #
AFGL-TR-81-0129 ..... N81-31315 #
AFGL-TR-81-0149 ..... N81-31726 #

AFHRL-TP-81-17 ..... N81-31104 #

AFHRL-TR-80-43 ..... N81-31868 #
AFHRL-TR-80-60 ..... N81-31235 #
AFHRL-TR-81-3 ..... N81-31234 #

AFOSR-81-0206TR ..... N81-31437 #

AFOSR-81-0548TR ..... N81-31908 #
AFOSR-81-0552TR ..... N81-31510 #
AFOSR-81-0553TR ..... N81-31273 #
AFOSR-81-0555TR ..... N81-31372 #
AFOSR-81-0556TR ..... N81-31938 #
AFOSR-81-0557TR ..... N81-31907 #
AFOSR-81-0558TR ..... N81-31864 #
AFOSR-81-0560TR ..... N81-31939 #
AFOSR-81-0567TR ..... N81-31342 #
AFOSR-81-0568TR ..... N81-31540 #
AFOSR-81-0570TR ..... N81-31541 #
AFOSR-81-0571TR ..... N81-32062 #
AFOSR-81-0572TR ..... N81-31153 #
AFOSR-81-0574TR ..... N81-31843 #
AFOSR-81-0576TR ..... N81-31311 #
AFOSR-81-0577TR ..... N81-31905 #
AFOSR-81-0578TR ..... N81-31886 #
AFOSR-81-0579TR ..... N81-31890 #
AFOSR-81-0580TR ..... N81-31512 #
AFOSR-81-0584TR ..... N81-31386 #
AFOSR-81-0588TR ..... N81-31513 #
AFOSR-81-0590TR ..... N81-31581 #
AFOSR-81-0591TR ..... N81-31929 #
AFOSR-81-0592TR ..... N81-31940 #
AFOSR-81-0593TR ..... N81-31515 #
AFOSR-81-0594TR ..... N81-31320 #
AFOSR-81-0595TR ..... N81-31387 #
AFOSR-81-0596TR ..... N81-31293 #
AFOSR-81-0599TR ..... N81-31318 #
AFOSR-81-0600TR ..... N81-31221 #
AFOSR-81-0604TR ..... N81-31514 #
AFOSR-81-0605TR ..... N81-31511 #
AFOSR-81-0610TR ..... N81-31842 #
AFOSR-81-0611TR ..... N81-31319 #
AFOSR-81-0613TR ..... N81-31539 #
AFOSR-81-0614TR ..... N81-31723 #

AFWAL-TR-80-1130 ..... N81-32061 #
AFWAL-TR-80-3125 ..... N81-31909 #
AFWAL-TR-81-2020 ..... N81-31219 #
AFWAL-TR-81-3064 ..... N81-31155 #

AG-10 ..... N81-31703 #

AGARD-AG-254 ..... N81-31172 #

AGARD-CP-311 ..... N81-31449 #

AGARD-LS-114 ..... N81-31105 #
AGARD-LS-115 ..... N81-31849 #

AGARD-R-677 ..... N81-31186 #
AGARD-R-681 ..... N81-31827 #

AGESS-810223 ..... N81-31614 #

AI-M-634 ..... N81-31888 #
AI-M-638 ..... N81-31889 #

AMA-80-1 ..... N81-31224* #

AMI-8104 ..... N81-31127* #

AMMRC-TR-81-33 ..... N81-31371 #

ANL-K-81-74 ..... N81-31653 #

ANL/CNSV-TM-59 ..... N81-31644 #

ANL/OEPM-80-8 ..... N81-31654 #

AR-002-232 ..... N81-31516 #
AR-002-407 ..... N81-31809
AR-002-409 ..... N81-31546

ARAP-346 ..... N81-31515 #

ARC-TN-1101 ..... N81-31271* #

ARI-TR-505 ..... N81-31856 #

ARL-TR-81-21 ..... N81-31421* #

ARL/MECH-ENG-NOTE-384 ..... N81-31516 #

ARL/PSU-TM-81-110 ..... N81-31958 #

ARLCD-CR-81001 ..... N81-31343 #

ARO-15812-MS ..... N81-31542 #

ASRL-TR-197-1 ..... N81-31628* #

AS03040R1 ..... N81-31607* #

ATR-2 ..... N81-31723 #
ATR-81(7700)-1 ..... N81-31738 #

BAW-1662 ..... N81-31657 #

BBC-RD-1981/3 ..... N81-31411

BBN-4529 ..... N81-32080 #

BDX-613-2306 ..... N81-31552 #
BDX-613-2449 ..... N81-31531 #
BDX-613-2594 ..... N81-31553 #
BDX-613-2625 ..... N81-31586 #
BDX-613-2629 ..... N81-31348 #

BLL-RISLEY-4270-(9091.9F) N81-31545

BM-IC-8821 ..... N81-31355 #

BM-OFR-33-81 ..... N81-31496 #

BM-RI-8511 ..... N81-31354 #
BM-RI-8514 ..... N81-31357 #
BM-RI-8515 ..... N81-31401 #
BM-RI-8518 ..... N81-31356 #

BMFT-FB-T-80-031 ..... N81-31671 #
BMFT-FB-T-80-054 ..... N81-31326 #
BMFT-FB-T-80-082 ..... N81-31492 #
BMFT-FB-T-80-083 ..... N81-31493 #
BMFT-FB-T-80-084 ..... N81-31494 #
BMFT-FB-T-80-119 ..... N81-31673 #

BMFT-FB-W-79-44 ..... N81-31993 #

BMRI-1981 ..... N81-31401 #

BNL-29497 ..... N81-31729 #
BNL-51230 ..... N81-31658 #
BNL-51361 ..... N81-31683 #

BR51204 ..... N81-31297 #
BR64523 ..... N81-31904 #
BR77714 ..... N81-31284 #
BR77777 ..... N81-32021 #
BR78387 ..... N81-31588 #
BR78416 ..... N81-31443 #
BR78550 ..... N81-31267 #
BR78592 ..... N81-31225 #
BR78637 ..... N81-31613 #
BR78676 ..... N81-31825 #
BR78678 ..... N81-31353 #
BR78811 ..... N81-31444 #

BTS-FR-80-129 ..... N81-32073* #

BULL-16-REV ..... N81-31606 #

CCTC-CSM-UM-246-80 ..... N81-31887 #
CCTC-CSM-UM-246-81 ..... N81-31887 #

CIRCULAR-R22 ..... N81-32084 #

CM-50 ..... N81-31688 #
CM-52 ..... N81-31689 #

CMEP-95-4120-VOL-39 ..... N81-31220 #

CONF-800274-1 ..... N81-31968 #
CONF-800864-2 ..... N81-31345 #
CONF-800944-7 ..... N81-31823 #
CONF-800944-8 ..... N81-31821 #
CONF-800979-20 ..... N81-31970 #
CONF-801102-38 ..... N81-31790 #
CONF-801111-43 ..... N81-31964 #
CONF-801111-44 ..... N81-31965 #
CONF-810144-1 ..... N81-32110 #
CONF-810144-2 ..... N81-31729 #
CONF-810314-161 ..... N81-31980 #
CONF-810368-2 ..... N81-31969 #
CONF-810375-1 ..... N81-32035 #
CONF-810429-32 ..... N81-32029 #
CONF-810450-1 ..... N81-31977 #
CONF-810480-1 ..... N81-31822 #
CONF-810485-1 ..... N81-31962 #
CONF-810488-1 ..... N81-31682 #

CONF-810511-4-REV-1 ..... N81-31486 #
CONF-810523-2 ..... N81-31894 #
CONF-810523-4 ..... N81-31869 #
CONF-810542-3 ..... N81-31640 #
CONF-810545-4 ..... N81-31404 #
CONF-810554-2 ..... N81-31812 #
CONF-810560-1 ..... N81-32077 #
CONF-810566-1 ..... N81-32066 #
CONF-810573-1(DRAFT) ..... N81-32067 #
CONF-810585-1 ..... N81-31963 #
CONF-810606-33 ..... N81-32030 #
CONF-810606-34 ..... N81-32031 #
CONF-810606-47 ..... N81-31824 #
CONF-810625-17 ..... N81-31585 #
CONF-810628-2 ..... N81-31916 #
CONF-810641-1 ..... N81-31488 #
CONF-810642-3 ..... N81-31641 #
CONF-810659-6 ..... N81-32033 #
CONF-810664-1 ..... N81-31517 #
CONF-810702-4 ..... N81-31915 #
CONF-810719-1 ..... N81-32017 #
CONF-810720-1 ..... N81-31972 #
CONF-810906-4 ..... N81-32036 #
CONF-7910229-1 ..... N81-31552 #
CONF-8006160-1 ..... N81-31321 #
CONF-8009151-1 ..... N81-31895 #
CONF-8009152 ..... N81-32076 #
CONF-800710201 ..... N81-31730 #

COO-1332-132 ..... N81-31684 #
COO-2218-203 ..... N81-32031 #
COO-2218-204 ..... N81-32030 #
COO-2218-214 ..... N81-31977 #

CORADCOM-79-0772-F ..... N81-32015 #

CRIF-PL-14-PT-1 ..... N81-31587 #

CTH-MATH-1981-1 ..... N81-31950 #

CTR-3-8-75-177-22F ..... N81-31409 #

CW-WR-76-02086 ..... N81-31554 #

DCA/DF-81/001A ..... N81-31887 #

DELET-TR-80-0314-2 ..... N81-31639 #

DFVLR-FB-81-15 ..... N81-31226 #
DFVLR-FB-81-16 ..... N81-31158 #
DFVLR-FB-81-17 ..... N81-31378 #

DGLR-80-02 ..... N81-31241 #

DGMK-31 ..... N81-31376 #

DHHS/PUB/FDA-81-8153 ..... N81-31826 #

DM-10805-008-07 ..... N81-31731 #

DNA-3964F-27 ..... N81-32016 #

DOE/BC-10043/25 ..... N81-31392 #

DOE/BETC/RI-80/12 ..... N81-31373 #

DOE/CE-20030/1 ..... N81-31643 #
DOE/CE-20098/1 ..... N81-31394 #
DOE/CE-20237/1 ..... N81-31667 #

DOE/CH-10003/1 ..... N81-31678 #

DOE/CS-10046/2-VOL-1 ..... N81-31660 #
DOE/CS-10046/2-VOL-2 ..... N81-31661 #
DOE/CS-30217/T1 ..... N81-31668 #
DOE/CS-31522/T2 ..... N81-31655 #
DOE/CS-34135/T4 ..... N81-31659 #
DOE/CS-34698/T1 ..... N81-31669 #
DOE/CS-40177/T2 ..... N81-31396 #

DOE/EIA-0288 ..... N81-31642 #

DOE/EP-0015 ..... N81-31685 #

DOE/ER-01198/1350 ..... N81-31488 #
DOE/ER-01545-308 ..... N81-31584 #
DOE/ER-01545/306 ..... N81-31968 #
DOE/ER-03416/21 ..... N81-31325 #
DOE/ER-05126/T2 ..... N81-31487 #
DOE/ER-10160/4 ..... N81-31732 #

DOE/ER-10424/1 ..... N81-31975 #
DOE/ER-10556/85 ..... N81-31346 #

DOE/ET-10029/T1 ..... N81-31731 #
DOE/ET-10069/T4 ..... N81-31389 #
DOE/ET-10245/1-VOL-1 ..... N81-31350 #
DOE/ET-10245/1-VOL-2 ..... N81-31351 #
DOE/ET-10744/T3 ..... N81-31390 #
DOE/ET-10815/T4 ..... N81-31518 #
DOE/ET-14806/T4 ..... N81-31391 #
DOE/ET-14809/6 ..... N81-31322 #
DOE/ET-20279/115 ..... N81-31491 #
DOE/ET-21056/T3 ..... N81-31651 #
DOE/ET-21067/2 ..... N81-31397 #
DOE/ET-27035/T1 ..... N81-31609 #
DOE/ET-27163/8 ..... N81-31662 #
DOE/ET-53004/20 ..... N81-31981 #

DOE/EV-01332/T1 ..... N81-31684 #
DOE/EV-03211/32 ..... N81-31813 #
DOE/EV-04568/T1 ..... N81-31814 #
DOE/EV-10428/8 ..... N81-31686 #
DOE/EV-10428/9 ..... N81-31610 #
DOE/EV-10503/1 ..... N81-31815 #

DOE/FC-02030/T1 ..... N81-31323 #

DOE/ID-01570/T21-VOL-2-APP-A-K ... N81-31652 #
DOE/ID-12051/T1 ..... N81-31393 #

DOE/NASA-51040-31 ..... N81-32087* #

DOE/NASA/0051-2 ..... N81-31632* #
DOE/NASA/3303-1 ..... N81-31628* #
DOE/NASA/10769-10 ..... N81-32026* #
DOE/NASA/12726-10 ..... N81-31308* #
DOE/NASA/51044-21 ..... N81-31627* #
DOE/NASA/281751 ..... N81-32088* #

DOE/RA-50366/T1 ..... N81-32089 #

DOE/TIC-1022359 ..... N81-31646 #
DOE/TIC-1022360 ..... N81-31647 #
DOE/TIC-1022361 ..... N81-31648 #

DOT-HS-805798-VOL-1 ..... N81-31298 #
DOT-HS-805799-VOL-2 ..... N81-31299 #
DOT-HS-805810 ..... N81-31555 #

DOT-RSPA-DPB-50-81-4 ..... N81-31560 #
DOT-RSPA-DPB-50-81-13 ..... N81-31703 #

DOT-TSC-NASA-81-1 ..... N81-32088* #

DP-1556 ..... N81-31687 #

DPST-80-466 ..... N81-31982 #

DRIC-T-6307 ..... N81-31825 #
DRIC-T-6345 ..... N81-31353 #

DTNSRDC-81/009 ..... N81-31233 #

DTNSRDC/PAS-80/42 ..... N81-31953 #

D180-26067-1 ..... N81-31292 #

E-209 ..... N81-31550* #
E-583 ..... N81-31129* #
E-590 ..... N81-31128* #
E-603 ..... N81-31282* #
E-751 ..... N81-31366* #
E-845 ..... N81-31196* #
E-902 ..... N81-32087* #
E-917 ..... N81-31190* #
E-918 ..... N81-31126* #
E-944 ..... N81-31627* #
E-954 ..... N81-31308* #
E-956 ..... N81-32026* #
E-957 ..... N81-31380* #
E-971 ..... N81-31956* #
E-977 ..... N81-31957* #
E-979 ..... N81-31195* #

EGG-002-80 ..... N81-31861* #
EGG-1183-1802 ..... N81-31532 #

EPA-450/4-80-020 ..... N81-31699 #
EPA-460/3-81-002 ..... N81-32092 #
EPA-600/J-81-137 ..... N81-31400 #
EPA-600/J-81-178 ..... N81-31620 #
EPA-600/2-80-205B ..... N81-31691 #
EPA-600/2-81-017 ..... N81-31695 #
EPA-600/2-81-070 ..... N81-31690 #
EPA-600/2-81-079 ..... N81-31693 #
EPA-600/2-81-080 ..... N81-31702 #
EPA-600/3-81-012 ..... N81-31617 #
EPA-600/3-81-032 ..... N81-31328 #
EPA-600/4-81-030 ..... N81-31797 #
EPA-600/7-80-185 ..... N81-31806 #
EPA-600/7-81-020A ..... N81-31692 #
EPA-600/7-81-085 ..... N81-31738 #
EPA-600/7-81-090 ..... N81-31696 #
EPA-600/8-80-029 ..... N81-31700 #
EPA-600/8-81-009 ..... N81-31739 #
EPA-905/4-80-003A ..... N81-31618 #
EPA-906/9-80-004A-PT-1 ..... N81-32078 #
EPA-906/9-80-004B-PT-2 ..... N81-32079 #

EPL-81-1 ..... N81-31810* #

EPRI-AP-1848 ..... N81-31664 #

EPRI-NP-1534-VOL-2 ..... N81-31530 #

ERL-0175-TR ..... N81-32063 #

ER81-4177 ..... N81-31528* #

ESD-PUBL-1678 ..... N81-31649 #

ESD-TR-81-4 ..... N81-31484 #
ESD-TR-81-93 ..... N81-31433 #
ESD-TR-81-135 ..... N81-31424 #
ESD-TR-81-172 ..... N81-32014 #

ESL-711353-3 ..... N81-31429 #
ESL-712684-8 ..... N81-31430 #

ETS-59 ..... N81-32014 #

EW-NI-04042 ..... N81-31596* #

E81-10204 ..... N81-31596* #
E81-10206 ..... N81-31597* #
E81-10207 ..... N81-31598* #
E81-10208 ..... N81-31599* #
E81-10210 ..... N81-31600* #

FAA-APO-81-6 ..... N81-31182 #

FAA-CT-80-51-1 ..... N81-31181 #
FAA-CT-81-18 ..... N81-31218 #
FAA-CT-81-35 ..... N81-31238 #
FAA-CT-81-44 ..... N81-31787 #

FAA-EM-81-7 ..... N81-31183 #

FAA-RD-80-125-1 ..... N81-31181 #
FAA-RD-81-40 ..... N81-31786 #
FAA-RD-81-47 ..... N81-31787 #

FC-LO-04000 ..... N81-31597* #
FC-LO-04014 ..... N81-31599* #

FCC/OST/TM-81-1 ..... N81-31448 #

FDA/BRH-81/57 ..... N81-31826 #

FE-2291-86 ..... N81-31554 #
FE-2893-66 ..... N81-31389 #

FERMILAB-CONF-81/38-THY ..... N81-31969 #
FERMILAB-CONF-81/44-THY ..... N81-31962 #

FHWA/IN/JHRP-80/14 ..... N81-31408 #

FHWA/KS-81/2 ..... N81-31590 #

FHWA/LA-80/147 ..... N81-31407 #

FHWA/TX-81/2-177-22F ..... N81-31409 #

FMR-10 ..... N81-31739 #

FOA-C-20332-D8 ..... N81-31917 #
FOA-C-20336-E3 ..... N81-31900 #
FOA-C-20344-D2 ..... N81-31748 #
FOA-C-20348-D4 ..... N81-31341 #
FOA-C-20349-F9 ..... N81-31291 #
FOA-C-20361-D3 ..... N81-32074 #
FOA-C-30166-E5 ..... N81-31170 #
FOA-C-30172-E1 ..... N81-31992 #
FOA-C-30180-E3 ..... N81-31275 #
FOA-C-53004-H9 ..... N81-31845 #
FOA-C-56020-H9 ..... N81-31857 #
FOA-C-59003-H9 ..... N81-31841 #

FR-80-11/AE ..... N81-31665 #
FR-14844 ..... N81-31192* #

FTL-R80-11 ..... N81-31160* #

FUB-2-1981 ..... N81-31446 #
FUB-3-1981 ..... N81-31920 #
FUB-4-1981 ..... N81-31447 #
FUB-44-1980 ..... N81-32010 #
FUB-49-1979 ..... N81-31870 #
FUB-49-1980 ..... N81-31445 #

GA-A-16140 ..... N81-31973 #
GA-A-16148 ..... N81-31896 #

GALCIT-SM-81-3 ..... N81-31581 #

GEPP-TIS-472 ..... N81-31375 #

GIT-EES-A-25225(F) ..... N81-31431 #

GPO-51-285 ..... N81-31383 #
GPO-59-476 ..... N81-31240 #
GPO-62-872 ..... N81-31636 #
GPO-66-114 ..... N81-31422 #
GPO-67-017 ..... N81-32083 #
GPO-68-746 ..... N81-31638 #
GPO-68-757 ..... N81-31637 #
GPO-69-289 ..... N81-31309 #
GPO-70-074 ..... N81-31403 #
GPO-70-454 ..... N81-31384 #
GPO-70-504 ..... N81-31381 #
GPO-71-047 ..... N81-31385 #
GPO-72-109 ..... N81-31635 #
GPO-74-059 ..... N81-31608 #
GPO-75-433 ..... N81-31420 #
GPO-75-804 ..... N81-31231 #
GPO-76-079 ..... N81-31382 #
GPO-79-550 ..... N81-32082 #

HEDL-SA-2231 ..... N81-31585 #

HIC-354 ..... N81-31221 #

HONEYWELL-8103-07-VOL-1 ..... N81-31991* #

IERL-RTP-1187 ..... N81-31696 #

IM-151280-1 ..... N81-31819 #

IPF-81-3-PT-2 ..... N81-31544 #

IPPJ-526 ..... N81-32025 #

IS-4761 ..... N81-31971 #

ISBN-3-7696-8539-3 ..... N81-31733 #
ISBN-3-7696-9308-6 ..... N81-31734 #
ISBN-3-922010-18-0 ..... N81-31241 #
ISBN-92-835-0292-2 ..... N81-31849 #
ISBN-92-835-0293-0 ..... N81-31827 #
ISBN-92-835-1383-5 ..... N81-31172 #
ISBN-92-835-1385-1 ..... N81-31105 #
ISBN-92-835-1388-6 ..... N81-31449 #
ISBN-92-835-1390-8 ..... N81-31186 #

ISI/RR-79-79 ..... N81-31891 #

ISSN-0065-5317 ..... N81-31733 #
ISSN-0065-5325 ..... N81-31734 #
ISSN-0077-5606 ..... N81-31747 #
ISSN-0080-4614 ..... N81-31500* #
ISSN-0080-4614 ..... N81-31716 #
ISSN-0082-5255 ..... N81-31266 #
ISSN-0082-5263 ..... N81-32027 #
ISSN-0170-1339 ..... N81-31993 #
ISSN-0340-7608 ..... N81-31326 #
ISSN-0340-7608 ..... N81-31492 #
ISSN-0340-7608 ..... N81-31493 #
ISSN-0340-7608 ..... N81-31494 #
ISSN-0340-7608 ..... N81-31671 #
ISSN-0340-7608 ..... N81-31673 #

ISSN-0342-4324 ..... N81-31740
ISSN-0342-4324 ..... N81-31741
ISSN-0342-4324 ..... N81-31742
ISSN-0348-7539 ..... N81-31735 #
ISSN-0348-7539 ..... N81-32042 #
ISSN-0348-7539 ..... N81-32106 #

IWIS-A-80-VK-01-01 ..... N81-32090 #

IWIS-TNO-A-79-ST-66-36 ..... N81-31951 #

JHRP-80-14 ..... N81-31408 #

JHU/APL/TG-1332 ..... N81-31274 #

JSC-16826 ..... N81-31598* #
JSC-16827 ..... N81-31597* #
JSC-16840 ..... N81-31599* #
JSC-17112 ..... N81-31596* #
JSC-17377 ..... N81-31882* #

J206-01-006-FR ..... N81-31976 #

KU-SFB-80/A/166 ..... N81-31521 #

L-14332 ..... N81-31509* #
L-14416 ..... N81-31130* #

LA-UR-81-318 ..... N81-31915 #
LA-UR-81-1247 ..... N81-32110 #
LA-UR-81-1409 ..... N81-31916 #
LA-UR-81-1442 ..... N81-32029 #
LA-UR-81-1453 ..... N81-31963 #
LA-UR-81-1550 ..... N81-31894 #
LA-UR-81-1568 ..... N81-31869 #
LA-UR-81-1584 ..... N81-32033 #
LA-UR-81-1962 ..... N81-32018 #

LA-8672 ..... N81-31728 #
LA-8751-HDR ..... N81-31611 #
LA-8808-MS ..... N81-31974 #
LA-8828-MS ..... N81-32037 #

LAPS-72 ..... N81-32040 #

LBL-11509 ..... N81-31645 #
LBL-11700 ..... N81-31811 #
LBL-12789 ..... N81-31966 #

LC-63-37059 ..... N81-31327 #
LC-80-607761 ..... N81-31357 #

LCDS-81-8 ..... N81-31905 #

LEMSCO-15305 ..... N81-31598* #
LEMSCO-15404 ..... N81-31597* #
LEMSCO-15612 ..... N81-31599* #
LEMSCO-15978 ..... N81-31596* #

LG81ER0159 ..... N81-31580* #

LIDS-P-1109 ..... N81-31559* #

LIDS-TH-1129 ..... N81-31952* #

LPN-OSURF-710525 ..... N81-32061 #
LPN-OSURF-764596 ..... N81-32061 #

M-323 ..... N81-32108* #
M-353 ..... N81-31365* #
M-355 ..... N81-31745* #

MAE-1466 ..... N81-31188 #

MC-IW-158/81 ..... N81-31901 #
MC-IW-161/81 ..... N81-31902 #
MC-IW-162/81 ..... N81-31903 #

MDC-G8631 ..... N81-31663 #
MDC-G9606 ..... N81-32101 #

MDC-Q0722 ..... N81-31153 #

MHSMP-81-29 ..... N81-31395 #

MMS-81-20 ..... N81-31934 #
MMS-81-21 ..... N81-31930 #
MMS-81-22 ..... N81-31931 #
MMS-81-23 ..... N81-31932 #
MMS-81-25 ..... N81-31933 #

MRC-R-583 ..... N81-32013 #

MRL-R-809 ..... N81-31809
MRL-R-811 ..... N81-31546

MS-1240 ..... N81-31377 #

MSSU-EIRS-ASE-81-5 ..... N81-31125* #

MTR-81W00160 ..... N81-31884 #
MTR-8174 ..... N81-31424 #

MWRRC-113 ..... N81-31619 #

NACOA-18 ..... N81-31808 #

NADC-13920-2 ..... N81-31187 #
NADC-81049-50 ..... N81-31191 #

NASA-CASE-ARC-11331-1 ..... N81-31363* #
NASA-CASE-ARC-11368-1 ..... N81-31364* #

NASA-CASE-GSC-12645-1 ..... N81-31482* #

NASA-CASE-LAR-12458-1 ..... N81-31230* #
NASA-CASE-LAR-12531-1 ..... N81-31529* #
NASA-CASE-LAR-12720-1 ..... N81-31229* #
NASA-CASE-LAR-12744-1 ..... N81-31551* #
NASA-CASE-LAR-12882-1 ..... N81-31848* #
NASA-CASE-LAR-12889-1 ..... N81-31483* #

NASA-CASE-MFS-25209-1 ..... N81-31480* #
NASA-CASE-MFS-25215-1 ..... N81-31481* #

NASA-CP-2183 ..... N81-31130* #
NASA-CP-2190 ..... N81-31196* #
NASA-CP-2194 ..... N81-31801* #

NASA-CR-3377 ..... N81-32108* #
NASA-CR-3451 ..... N81-31224* #
NASA-CR-3456 ..... N81-31745* #
NASA-CR-3459 ..... N81-31680* #
NASA-CR-3461-VOL-1 ..... N81-31171* #
NASA-CR-3466 ..... N81-31127* #
NASA-CR-156877 ..... N81-31605* #
NASA-CR-156878 ..... N81-31604* #
NASA-CR-159065 ..... N81-31881* #
NASA-CR-160007 ..... N81-31423* #
NASA-CR-160070 ..... N81-31362* #
NASA-CR-160953 ..... N81-31596* #
NASA-CR-160969 ..... N81-31597* #
NASA-CR-160970 ..... N81-31598* #
NASA-CR-160971 ..... N81-31599* #
NASA-CR-160973 ..... N81-31600* #
NASA-CR-161049 ..... N81-31633* #
NASA-CR-161074 ..... N81-31421* #
NASA-CR-161076 ..... N81-31882* #
NASA-CR-161830 ..... N81-31625* #
NASA-CR-161841 ..... N81-31634* #
NASA-CR-161842 ..... N81-31192* #
NASA-CR-161843 ..... N81-31526* #
NASA-CR-161844 ..... N81-31537* #
NASA-CR-161846 ..... N81-31607* #
NASA-CR-161847 ..... N81-31602* #
NASA-CR-161848 ..... N81-31603* #
NASA-CR-164607 ..... N81-31497* #
NASA-CR-164719 ..... N81-31159* #
NASA-CR-164720 ..... N81-31717* #
NASA-CR-164721 ..... N81-31911* #
NASA-CR-164722 ..... N81-31601* #
NASA-CR-164723 ..... N81-31507* #
NASA-CR-164724 ..... N81-31719* #
NASA-CR-164725 ..... N81-31810* #
NASA-CR-164727 ..... N81-32107* #
NASA-CR-164729 ..... N81-31847* #
NASA-CR-164730 ..... N81-31125* #
NASA-CR-164732 ..... N81-31952* #
NASA-CR-164733 ..... N81-32086* #
NASA-CR-164742 ..... N81-31277* #
NASA-CR-164847 ..... N81-31559* #
NASA-CR-165235 ..... N81-31632* #
NASA-CR-165281 ..... N81-32088* #
NASA-CR-165339 ..... N81-31361* #
NASA-CR-165375 ..... N81-31549* #
NASA-CR-165385 ..... N81-31628* #
NASA-CR-165402 ..... N81-31340* #
NASA-CR-165418 ..... N81-31193* #
NASA-CR-165420-VOL-1 ..... N81-31630* #
NASA-CR-165420-VOL-2 ..... N81-31631* #
NASA-CR-165437 ..... N81-31288* #

NASA-CR-165451 ..... N81-31290* #
NASA-CR-165454 ..... N81-31419* #
NASA-CR-165456 ..... N81-31194* #
NASA-CR-165464 ..... N81-31339* #
NASA-CR-165632 ..... N81-31576* #
NASA-CR-165654 ..... N81-31160* #
NASA-CR-165669 ..... N81-31579* #
NASA-CR-165744 ..... N81-31271* #
NASA-CR-165759 ..... N81-31580* #
NASA-CR-165764 ..... N81-31629* #
NASA-CR-165766 ..... N81-31990* #
NASA-CR-165768 ..... N81-31184* #
NASA-CR-166701 ..... N81-31626* #
NASA-CR-166703 ..... N81-31861* #
NASA-CR-166704 ..... N81-32096* #
NASA-CR-166705 ..... N81-31991* #
NASA-CR-166706 ..... N81-32073* #
NASA-CR-166707 ..... N81-31476*

NASA-NEWS-RELEASE-81-116 ..... N81-32102*

NASA-SP-5021(22) N81-32085*
NASA-SP-7011(222) N81-31816*
NASA-SP-7037(137) N81-31103*

NASA-TM-80458 ..... N81-31718* #
NASA-TM-81306 ..... N81-31228* #
NASA-TM-81315 ..... N81-31508* #
NASA-TM-81318 ..... N81-31289* #
NASA-TM-81691 ..... N81-31550* #
NASA-TM-81800 ..... N81-31227* #
NASA-TM-81923 ..... N81-31124* #
NASA-TM-82157 ..... N81-31721* #
NASA-TM-82170 ..... N81-31720* #
NASA-TM-82172 ..... N81-31746* #
NASA-TM-82179 ..... N81-32097* #
NASA-TM-82290 ..... N81-31276* #
NASA-TM-82331 ..... N81-31500* #
NASA-TM-82429 ..... N81-31402* #
NASA-TM-82435 ..... N81-31744* #
NASA-TM-82436 ..... N81-31743* #
NASA-TM-82439 ..... N81-31283* #
NASA-TM-82646 ..... N81-32087* #
NASA-TM-82654 ..... N81-31190* #
NASA-TM-82655 ..... N81-31126* #
NASA-TM-82667 ..... N81-31627* #
NASA-TM-82672 ..... N81-31308* #
NASA-TM-82673 ..... N81-32026* #
NASA-TM-82674 ..... N81-31380* #
NASA-TM-82690 ..... N81-31956* #
NASA-TM-82694 ..... N81-31957* #
NASA-TM-82696 ..... N81-31195* #
NASA-TM-83172 ..... N81-31360* #
NASA-TM-83183 ..... N81-31577* #
NASA-TM-83195 ..... N81-31418* #
NASA-TM-83200 ..... N81-31578* #
NASA-TM-83810 ..... N81-32100* #
NASA-TM-84011 ..... N81-32081* #
NASA-TM-84012 ..... N81-32095* #
NASA-TM-84013 ..... N81-31239* #
NASA-TM-84014 ..... N81-31272* #

NASA-TP-1800 ..... N81-31282* #
NASA-TP-1852 ..... N81-31281* #
NASA-TP-1866 ..... N81-31129* #
NASA-TP-1869 ..... N81-31509* #
NASA-TP-1875 ..... N81-31162* #
NASA-TP-1899 ..... N81-31366* #
NASA-TP-1900 ..... N81-31365* #
NASA-TP-1920 ..... N81-31126* #
NASA-TP-1921 ..... N81-31185* #

NAVTRAEQUIPC-IH-321 ..... N81-31232 #

NBSIR-81-2204 ..... N81-31497* #
NBSIR-81-2220 ..... N81-31495 #
NBSIR-81-2221 ..... N81-31498 #
NBSIR-81-2255 ..... N81-31591 #
NBSIR-81-2267 ..... N81-31499 #

NEAR-TR-226 ..... N81-31154 #

NEPRF-CR-81-02 ..... N81-31785 #

NLR-MP-79039-U ..... N81-31189 #
NLR-MP-80015-U ..... N81-31524 #
NLR-MP-80024-U ..... N81-31222 #
NLR-MP-80032-U ..... N81-31525 #
NLR-MP-80034-U ..... N81-31526 #
NLR-MP-80035-U ..... N81-31919 #

NLR-TR-79097-U ..... N81-31523 #
NLR-TR-79116-U-PT-1 ..... N81-31279 #
NLR-TR-79116-U-PT-2 ..... N81-31280 #
NLR-TR-79121-U ..... N81-31589 #
NLR-TR-80042-U ..... N81-31156 #
NLR-TR-80078-U ..... N81-31157 #

NMI-R-71 ..... N81-31522 #
NMI-R-72 ..... N81-32020 #

NOAA-ERL-ARL-2 ..... N81-31800 #

NOAA-NWSTM-PR-22 ..... N81-31799 #

NOAA-TM-ERL-AOML-45 ..... N81-31807 #

NOAA-TM-ERL-NHEML-8 ..... N81-31798 #

NOAA-TM-NESS-113 ..... N81-31615 #

NOAA-TM-NOS-NGS-30 ..... N81-31736 #

NOAA-81020402 ..... N81-31795 #
NOAA-81021302 ..... N81-31796 #
NOAA-81021710 ..... N81-31615 #
NOAA-81031301 ..... N81-32111 #
NOAA-81031302 ..... N81-32112 #
NOAA-81031601 ..... N81-31799 #
NOAA-81031602 ..... N81-31736 #
NOAA-81031704 ..... N81-31798 #
NOAA-81031705 ..... N81-31807 #
NOAA-81031706 ..... N81-31800 #
NOAA-81032302 ..... N81-31805 #

NPS55-81-013 ..... N81-31427 #
NPS63-81-002 ..... N81-31784 #

NRC/CNR-TT-1983 ..... N81-31747 #

NRL-MR-4578 ..... N81-31388 #
NRL-MR-4588 ..... N81-31278 #

NSF/MEA-81002 ..... N81-31556 #

NSF/RA-800417 ..... N81-31406 #
NSF/RA-800474 ..... N81-31410 #

NSWC/TR-80-166 ..... N81-31928 #
NSWC/TR-80-417 ..... N81-31268 #
NSWC/TR-81-103 ..... N81-31538 #
NSWC/TR-81-246 ..... N81-31727 #

NTIA-REPT-81-63 ..... N81-31675 #
NTIA-REPT-81-64 ..... N81-31676 #
NTIA-REPT-81-65 ..... N81-31677 #

NYERDA-80-21 ..... N81-31399 #

O-491-213-81-02 ..... N81-31272* #

ONR-CR-215-262-1F ..... N81-31188 #

ORC-81-17 ..... N81-31906 #

ORNL-5749 ..... N81-32076 #

ORNL/TM-7694 ..... N81-31649 #
ORNL/TM-7778 ..... N81-32039 #

ORO-4568-30 ..... N81-31814 #
ORO-5126-135 ..... N81-31487 #

OSU-CISRC-TR-81-5 ..... N81-31886 #

OT-R-8004 ..... N81-31522 #
OT-R-8006 ..... N81-32020 #

OWRT-A-047-TEX(1) ..... N81-31698 #
OWRT-A-048-TEX(1) ..... N81-31622 #
OWRT-A-116-MONT(1) ..... N81-31619 #
OWRT-A-117-MO(1) ..... N81-31697 #

CWRT-B-054-MASS(3) ..... N81-31701 #
CWRT-B-201-CAL(1) ..... N81-31737 #

CWRT-C-90071-G/C-00191-G9412-3 ..... N81-31674 #

PB81-176216 ..... N81-31406 #
PB81-180945 ..... N81-32078 #
PB81-180952 ..... N81-32079 #
PB81-183907 ..... N81-31556 #
PB81-184038 ..... N81-31615 #
PB81-184129 ..... N81-31674 #
PB81-185603 ..... N81-31794 #
PB81-186652 ..... N81-31555 #
PB81-186751 ..... N81-31614 #
PB81-191082 ..... N81-31298 #
PB81-191090 ..... N81-31299 #
PB81-193781 ..... N81-31675 #
PB81-194177 ..... N81-31560 #
PB81-194250 ..... N81-31677 #
PB81-194268 ..... N81-31676 #
PB81-194540 ..... N81-31496 #
PB81-194672 ..... N81-31448 #
PB81-195372 ..... N81-31795 #
PB81-195414 ..... N81-31796 #
PB81-195679 ..... N81-31410 #
PB81-195885 ..... N81-31616 #
PB81-196024 ..... N81-31955 #
PB81-196198 ..... N81-31327 #
PB81-196313 ..... N81-31804 #
PB81-196347 ..... N81-31497* #
PB81-196362 ..... N81-32080 #
PB81-196446 ..... N81-32092 #
PB81-196511 ..... N81-31617 #
PB81-196552 ..... N81-31399 #
PB81-196594 ..... N81-31690 #
PB81-196602 ..... N81-31691 #
PB81-196628 ..... N81-31692 #
PB81-196636 ..... N81-31618 #
PB81-196727 ..... N81-31354 #
PB81-196735 ..... N81-31401 #
PB81-196784 ..... N81-31693 #
PB81-196834 ..... N81-31738 #
PB81-196883 ..... N81-31591 #
PB81-196990 ..... N81-31694 #
PB81-197006 ..... N81-31495 #
PB81-197048 ..... N81-31498 #
PB81-197139 ..... N81-31356 #
PB81-197147 ..... N81-31355 #
PB81-197196 ..... N81-31357 #
PB81-197345 ..... N81-31806 #
PB81-197394 ..... N81-31407 #
PB81-197626 ..... N81-31737 #
PB81-197774 ..... N81-31695 #
PB81-197865 ..... N81-32091 #
PB81-197873 ..... N81-31696 #
PB81-198087 ..... N81-32111 #
PB81-198095 ..... N81-32112 #
PB81-198293 ..... N81-31797 #
PB81-198335 ..... N81-31697 #
PB81-198384 ..... N81-31698 #
PB81-198442 ..... N81-31619 #
PB81-198483 ..... N81-31826 #
PB81-198673 ..... N81-31703 #
PB81-198681 ..... N81-31798 #
PB81-198699 ..... N81-31799 #
PB81-198715 ..... N81-31800 #
PB81-198723 ..... N81-31736 #
PB81-198939 ..... N81-31807 #
PB81-199598 ..... N81-31805 #
PB81-199952 ..... N81-31400 #
PB81-200073 ..... N81-31408 #
PB81-200081 ..... N81-31590 #
PB81-200453 ..... N81-31620 #
PB81-200529 ..... N81-31699 #
PB81-200578 ..... N81-31409 #
PB81-200602 ..... N81-31808 #
PB81-200628 ..... N81-31328 #
PB81-200651 ..... N81-31621 #
PB81-200800 ..... N81-31700 #
PB81-201410 ..... N81-31739 #
PB81-202079 ..... N81-31622 #
PB81-202210 ..... N81-31701 #
PB81-206005 ..... N81-31702 #
PB81-218182 ..... N81-31499 #

PD34 ..... N81-31744* #

PERME-MEMO-150 ..... N81-31284 #

PLF-31 ..... N81-31543 #

PNL-3622 ..... N81-31791 #
PNL-3771 ..... N81-31792 #

PNR-90063 ..... N81-31793 #
PNR-90064 ..... N81-31959 #
PNR-90065 ..... N81-31352 #
PNR-90068 ..... N81-31398 #

POLY-EE/CS-81-002 ..... N81-31428 #

POLY-MRI-1412-80-REV ..... N81-31342 #
POLY-MRI-1414-81 ..... N81-31540 #

PPPL-1784 ..... N81-32032 #
PPPL-1796 ..... N81-32034 #

PREPRINT-64 ..... N81-32071 #
PREPRINT-80-635 ..... N81-31410 #

PRRL-80-CR-20 ..... N81-32065 #

PTR-1092-81-7 ..... N81-31844 #

PUB-118 ..... N81-31701 #

PUBL-96-126 ..... N81-31381 #
PUBL-97-3 ..... N81-31385 #
PUBL-97-4 ..... N81-31608 #

P81-10118 ..... N81-32102*

QM-80-178 ..... N81-31274 #

QPR-12 ..... N81-31371 #

QR-2 ..... N81-31639 #

RADC-TR-81-89 ..... N81-31429 #
RADC-TR-81-94 ..... N81-31883 #
RADC-TR-81-96 ..... N81-31954 #
RADC-TR-81-102 ..... N81-31892 #
RADC-TR-81-109 ..... N81-31431 #
RADC-TR-81-110 ..... N81-31439 #
RADC-TR-81-112 ..... N81-31425 #
RADC-TR-81-125 ..... N81-31862 #
RADC-TR-81-128 ..... N81-31867 #

RAE-FS-140 ..... N81-31588 #

RAE-MAT-271 ..... N81-31297 #

RAE-SPACE-591 ..... N81-31267 #
RAE-SPACE-592 ..... N81-31613 #

RAE-TR-75144 ..... N81-31297 #
RAE-TR-81006 ..... N81-31267 #
RAE-TR-81010 ..... N81-31613 #
RAE-TR-81014 ..... N81-31588 #

REPT-8 ..... N81-31941 #
REPT-9 ..... N81-31927 #
REPT-10 ..... N81-31949 #
REPT-12 ..... N81-31438 #
REPT-80-9B7-SIMOD-R2 ..... N81-31290* #
REPT-81-8 ..... N81-31582 #
REPT-81-10 ..... N81-31583 #
REPT-81F0051 ..... N81-31281* #
REPT-455-TBR-67 ..... N81-31441 #
REPT-455-TBR-70 ..... N81-31442 #
REPT-465-TBR-20 ..... N81-32019 #
REPT-78243-630-004 ..... N81-31912 #

RHO-C-50 ..... N81-31405 #

RHO-LD-49 ..... N81-31519 #

RI-1981 ..... N81-31356 #

RLO-1388-856 ..... N81-31487 #

RMCS-80002 ..... N81-31225 #

RPDL-81-38 ..... N81-31981 #

RR-81-1 ..... N81-31937 #
RR-145 ..... N81-31910 #

RS-07-UT(3) ..... N81-31612 #

RSRE-MEMO-2875 ..... N81-31904 #
RSRE-MEMO-3295 ..... N81-32021 #
RSRE-MEMO-3348 ..... N81-31443 #
RSRE-MEMO-3350 ..... N81-31444 #

RTCA/DO-177 ..... N81-31180 #

R81-915215-4 ..... N81-31339* #
R81AEG213 ..... N81-31218 #

R81AEG393 ..... N81-31194* #

S-887-81-01 ..... N81-31239* #

SAC/LGME-ER-S-115 ..... N81-31820 #

SAI-78-604-LJ-6 ..... N81-32016 #
SAI-81-030-CP ..... N81-31320 #
SAI-023-81-189-LJ ..... N81-32040 #
SAI-023-81-215-LJ ..... N81-32041 #
SAI-131-80-578-LJ ..... N81-31680* #

SAND-78-8192 ..... N81-31663 #
SAND-79-8189 ..... N81-31656 #
SAND-80-0732-PT-1 ..... N81-31349 #
SAND-80-1132 ..... N81-31374 #
SAND-80-1988 ..... N81-31490 #
SAND-80-2500 ..... N81-32038 #
SAND-80-7082 ..... N81-31665 #
SAND-80-7154/1-VOL-1 ..... N81-31898 #
SAND-80-7154/2-VOL-2 ..... N81-31899 #
SAND-80-8190 ..... N81-31657 #
SAND-81-0627 ..... N81-31897 #
SAND-81-1268C ..... N81-32017 #
SAND-81-7120C ..... N81-31641 #
SAND-81-8005 ..... N81-31670 #
SAND-81-8211 ..... N81-31295 #
SAND-81-8214 ..... N81-32075 #

SCIENTIFIC-1 ..... N81-31315 #
SCIENTIFIC-2 ..... N81-32109 #

SC234.6FR ..... N81-31344 #
SC5099.4FR ..... N81-31372 #
SC5202.11FR ..... N81-32064 #

SDAC-TR-80-1 ..... N81-31724 #

SER-B-245 ..... N81-31733 #

SER-C-256 ..... N81-31734 #

SERI/TP-513-1193 ..... N81-32077 #
SERI/TP-721-1198 ..... N81-31404 #

SERI/TR-8002-6-T1 ..... N81-31347 #
SERI/TR-8274-1-T1 ..... N81-31650 #

SGD-437-PT-1 ..... N81-32111 #
SGD-437-PT-2 ..... N81-32112 #

SIO-REF-81-9 ..... N81-31592 #

SKF-AT81T014 ..... N81-31549* #

SLAC-PUB-2705 ..... N81-31980 #
SLAC-PUB-2722 ..... N81-32035 #
SLAC-PUB-2729 ..... N81-31967 #

SLAC-240 ..... N81-32069 #

SNIAS-802-422-104 ..... N81-31296 #
SNIAS-802-422-106 ..... N81-31270

SOLAR/1022-81/50 ..... N81-31666 #

SR-IX-04046 ..... N81-31600* #

SR-LO-00499 ..... N81-31598* #

SR-2 ..... N81-32109 #

SRD-81-020-PT-B ..... N81-31602* #

SU-TR-44 ..... N81-31610 #

SUDAM-81-2 ..... N81-31440 #

T-106 ..... N81-31847* #

TLT-00814 ..... N81-31793 #
TLT-00819 ..... N81-31352 #

TPRL-250 ..... N81-31311 #

TR-1 ..... N81-31367 #
TR-2 ..... N81-31369 #
TR-3 ..... N81-31368 #
TR-4 ..... N81-31310 #
TR-15 ..... N81-31947 #
TR-16 ..... N81-31313 #
TR-17 ..... N81-31285 #
TR-27 ..... N81-31286 #
TR-28 ..... N81-31317 #
TR-43 ..... N81-31686 #
TR-50 ..... N81-31948 #
TR-72 ..... N81-31885 #
TR-83 ..... N81-31913 #
TR-85 ..... N81-31346 #
TR-101 ..... N81-31935 #
TR-102 ..... N81-31937 #
TR-105 ..... N81-31936 #
TR-109 ..... N81-31698 #
TR-114 ..... N81-31622 #
TR-298 ..... N81-31945 #
TR-299 ..... N81-31946 #
TR-300 ..... N81-31942 #
TR-301 ..... N81-31914 #
TR-302 ..... N81-31943 #
TR-303 ..... N81-31944 #
TR-566 ..... N81-31433 #
TR-1040 ..... N81-31938 #
TR-1043 ..... N81-31939 #
TR-1048 ..... N81-31907 #
TR-1050 ..... N81-31908 #
TR-1053 ..... N81-31890 #
TR-1530 ..... N81-31277* #
TR-712684-8 ..... N81-31430 #

TRANS-15522 ..... N81-31793 #
TRANS-15543 ..... N81-31352 #

TRITA-EPP-80-12 ..... N81-31735 #
TRITA-EPP-80-13 ..... N81-32042 #
TRITA-EPP-81-01 ..... N81-32106 #

TRITA-NA-8007 ..... N81-31918 #

TRS-8001 ..... N81-31694 #

TRW-ER-8019-F ..... N81-31193* #

UCID-19000 ..... N81-31324 #
UCID-19077 ..... N81-31489 #

UCRL-15359 ..... N81-31294 #
UCRL-50400-VOL-24 ..... N81-31979 #
UCRL-53074 ..... N81-31542 #
UCRL-53112 ..... N81-31978 #
UCRL-84146 ..... N81-32068 #
UCRL-84959 ..... N81-31895 #
UCRL-85226 ..... N81-31517 #
UCRL-85367 ..... N81-31682 #
UCRL-85814 ..... N81-31730 #
UCRL-85828-REV-1 ..... N81-31486 #
UCRL-85912 ..... N81-32036 #

UDR-TR-78-3524 ..... N81-31155 #

UIEM-81-4 ..... N81-31432 #

UILU-ENG-81-0501 ..... N81-31386 #
UILU-ENG-81-2545 ..... N81-31432 #

UM-016968-2 ..... N81-31387 #

UMASS-ARF-81-315 ..... N81-31315 #

UMTA-WI-09-8004-81-1 ..... N81-32091 #

US-PATENT-APPL-SN-267179 ..... N81-31848* #
US-PATENT-APPL-SN-270762 ..... N81-31551* #
US-PATENT-APPL-SN-274705 ..... N81-31230* #
US-PATENT-APPL-SN-274706 ..... N81-31229* #
US-PATENT-APPL-SN-282191 ..... N81-31529* #
US-PATENT-APPL-SN-284314 ..... N81-31482* #
US-PATENT-APPL-SN-288267 ..... N81-31364* #
US-PATENT-APPL-SN-288279 ..... N81-31363* #
US-PATENT-APPL-SN-288434 ..... N81-31483* #
US-PATENT-APPL-SN-291131 ..... N81-31481* #
US-PATENT-APPL-SN-291132 ..... N81-31480* #

USAFETAC/DS-81/048 ..... N81-31788 #
USAFETAC/DS-81/050 ..... N81-31789 #

USCIPI-1010 ..... N81-31893 #

USGS-WDR-MD-DE-80-1 ..... N81-31616 #

USGS/WRD/HD-81/033 ..... N81-31616 #
USGS/WRD/WRI-81/023 ..... N81-31621 #

USGS/WRI/NTIS-80/92 ..... N81-31621 #

UTIAS-TN-230 ..... N81-32027 #

UTIAS-244 ..... N81-31266 #

UVA/528166/MAE81/101 ..... N81-31159* #

UW-EE-TR-221 ..... N81-31437 #

VSC-TR-81-13 ..... N81-31724 #

WRC-79-106-39 ..... N81-31220 #

WRI-80-92 ..... N81-31621 #

WSRL-0178-TR ..... N81-31434 #
WSRL-0182-TR ..... N81-31435 #

W81-02431 ..... N81-31674 #
W81-02711 ..... N81-31737 #
W81-02714 ..... N81-31697 #
W81-02719 ..... N81-31698 #
W81-02726 ..... N81-31619 #
W81-02901 ..... N81-31701 #
W81-02907 ..... N81-31622 #

X-695-78-25 ..... N81-32095* #

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